



Report of the Forestry Committee



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CHAPTER I.

THE CONSTITUTION OF THE COMMITTEE.

1. Personnel and terms of reference.—The following press communiqué was issued by the Government of India on the 5th February 1929 :—

“ In order to define the lines of future activity and advance of the Forest Research Institute which is now nearing completion, the Government of India have decided to appoint a small committee consisting of Sir Chunilal Mehta, K.C.S.I., M.A., LL.B., J.P., who will be Chairman, and of Professor F. A. Lindemann, F.R.S., Professor of Experimental Philosophy, Oxford, and Mr. F. H. Wroughton, Manager, Bombay Burma Trading Corporation, Limited, Rangoon, who will be members.

“ 2. The terms of reference to the Committee are as follows :—

“ To enquire into—

“ (a) the organisation, working and control of the Forest Research Institute at Dehra Dun, with special reference to the scientific and economic value of the work already done, and the desirability, or otherwise, of periodical scrutiny in the future ;

“ (b) the need for ensuring co-ordination, with a view to the achievement of scientific accuracy and to the better interchange of knowledge, between the enquiries in progress at the Institute and similar investigations abroad, especially in America and Europe, and for ensuring suitable publicity of such results as are capable of utilisation for industrial purposes ;

“ (c) the system of recruiting members of the staff, especially technical experts and

“ (d) the system of training Indians for scientific research :

“ and to make recommendations.

“ 3. The Committee will start work at Dehra Dun from about the middle of February.”

2. Acknowledgments.—In accordance with the above the Committee met at Dehra Dun ; and they wish to thank the Inspector General of Forests and President of the Forest Research Institute and all the officers who supplied whatever information was required and who gave every assistance to the Committee. The report itself was written in Delhi.

CHAPTER II.

INTRODUCTION.

3. Introduction.—We would premiss our report by remarking that we have taken full advantage of the latitude allowed us by our terms of reference. Where they are precise they would appear to be merely illustrative and where they are general they are so wide as to set no bounds to our enquiries. We have interpreted them as a general commission to inquire into the working of the Institute and we have endeavoured, in accordance with the spirit and letter of the last term of reference, to sketch out a nucleus about which we hope the various activities of the Institute will crystallise into a harmonious configuration.

The Institute has passed through a period of rapid development and change, but it has still far to go before it reaches the stage when the mode of its activities and the nature of its external relationships have been finally determined. It is a comparatively easy task to organise the parts of a static body in such a way that the combination will produce the maximum efficiency. But it is always difficult to control and direct a growing body. In a period of growth it is too much to expect that all the members should develop with equal success and that there should be no lack of balance and proportion between them. The moment for reviewing the activities of the Institute and making suggestions for its future has, we believe, been well chosen. The development of the different parts of the Institute has not been uniform; the scope of its activities has not always been defined with great precision, and staff and equipment have necessarily expanded, not so much in accordance with any pre-conceived policy, as to meet the demands of the moment. We have endeavoured in our recommendations to systematise the existing methods and to co-ordinate the various activities of the Institute rather than to propose any radical changes. For such, indeed, we see no need. We do not pretend that our proposals are exhaustive, but we believe that their adoption will assist the Institute to develop along healthy lines. In any case, details of organisation can only play a minor part. The future of the Institute lies in the hands of those who work there. If an atmosphere of harmony and mutual confidence is established, the pre-eminence of the Institute in forestry research should be assured. The task of building up a great institution is no light one. It demands energy, foresight and enthusiasm in those who undertake it, and, where the institution is one whose aims are largely scientific, far more than mere administrative ability is required to direct its activities aright. We consider that the men who initiated and built up the Forest Research Institute have shown capacity and ability beyond all praise. They have laid a firm foundation for the future; and if the spirit which actuated them lives on in the Institute its work cannot fail to be of great and lasting benefit both to the Government and the peoples of India.

CHAPTER III.

HISTORY OF THE INSTITUTE.

4. The Creation of the Institute.—The history of the Forest Research Institute is intimately connected with that of the College for the training of forest officers, which is also located at Dehra Dun, and in tracing the development of the Institute during the last 23 years it will be necessary to refer to changes in the College which themselves affected that development.

In the years 1904 and 1905 there was protracted discussion on the means which should be adopted to establish a centre at which forestry research could be carried on. It was realised that executive officers could not undertake specialised work in the normal course of their duties, and examination of the arrangements prevailing in other countries showed that in them special facilities were invariably afforded for research into problems connected with forestry. The urgency of the need for inaugurating research work in India was, indeed, never questioned, and when the Inspector General of Forests, Mr. (later Sir) Sainthill Eardley-Wilot, prepared a scheme which would enable research work to be started, it was accepted and supported by Government.

In 1906 there existed at Dehra Dun a school, known as the Imperial Forest School, for giving elementary training in forestry to Rangers. This school was staffed at the time by a Director, a Deputy Director, two Imperial Service Instructors, and two Assistant Instructors drawn from the Provincial Service; an Imperial Service Entomologist had also been appointed three years earlier. It was decided to reorganise the school completely and to re-establish it with different functions and with an increased staff. The school accordingly ceased to exist in its original form and was reconstituted as the Imperial Forest Research Institute and College. Not only was research work to be undertaken for the first time, but the educational activities of the new College were to be different from those which had been carried on by the old School. In the past recruitment to the Provincial Forest Service had been made by promoting Rangers of standing and experience from the Subordinate Service. It was now decided to start a system of direct appointment to the Provincial Service, and probationers were to undergo a third year's training at Dehra Dun on completion of the two years' course prescribed for Rangers. To provide this additional training and to carry out research work the staff of the new Institute and College was reorganised so as to include the following posts:—

- An Imperial Silviculturist,
- An Imperial Superintendent of Forest Working Plans,
- An Imperial Forest Zoologist,
- An Imperial Forest Botanist,
- An Imperial Forest Chemist,
- An Imperial Forest Economist.

These officers were to devote their attention mainly to research work but they were also to deliver lectures at the College and take part in the training of candidates for the Provincial and Subordinate Services. The

educational work, however, was to be carried on mainly by four Assistant Instructors selected from the Provincial Forest Service. The post of Principal was to be held by one of the Imperial Service officers in addition to his other duties. The Imperial Forest School had been under the administrative control of the Inspector General of Forests ; but this officer had been assisted ever since 1891 by a Board of Control, of which he was *ex-officio* President. The members of this Board included the Director of Public Instruction of the United Provinces, the Director of the School, and one Conservator from each Province (not more than three serving in any given year) whilst the Assistant Inspector General of Forests acted as Secretary. The function of the Board had been mainly to conduct examinations and advise on the curriculum of studies at the School, and for some years it continued to act in the same capacity with reference to the activities of the new Institute and College. The buildings of the old Forest School, together with those which had been occupied by the Conservator of the recently abolished School Circle, were found adequate to supply the immediate needs of the new Institute and College ; and there were already at Dehra Dun a good library, a good forest museum and herbarium, and fairly equipped laboratories,

5. The period 1906 to 1909.—The new scheme was put into immediate practice, but between 1906 and 1909 several modifications were made in it. An Imperial Superintendent of Working Plans was appointed at once, and the post of Imperial Silviculturist was held by the Principal. This arrangement did not prove satisfactory, as it led to the neglect of silvicultural research. After three years the post of Principal was made separate and the posts of Superintendent of Working Plans and of Silviculturist were amalgamated.

The system by which the educational work was done by Assistant Instructors drawn from the Provincial Forest Service also proved unsatisfactory, and it was found necessary to depute both the Imperial Forest Zoologist and the Chemist (who had been appointed on a seven years contract from outside) to act as Instructors, whilst a third Instructor had also to be specially appointed.

6. The period 1909 to 1914.—Up to 1909 changes mainly consisted in re-adjustments of the existing staff and only one extra Imperial Service officer was appointed. In 1909 a matter of major importance came under discussion. It was proposed to constitute a Board of Forestry which would supersede the existing Board of Control and which, without exercising any executive control over the Research Institute or College and without interfering in any way with the functions of Local Governments, would advise on the management and work of the Forest Research Institute. The Board of Forestry was finally constituted in 1910 and was composed of the following members :—

President ;

The Inspector General of Forests,

Members ;

A Chief Conservator or Conservator from each province where officers of that rank were stationed.

The President of the Imperial Forest Research Institute.

Secretary ;

The Assistant Inspector General of Forests.

The Board was to be convened on each occasion at such time and place as might be fixed by the Inspector General of Forests with the approval of the Government of India. The Board met for the first time at the end of March 1910, and one of its first actions was to express its entire agreement with a resolution passed in the previous year by the Board of Control advocating the institution of an entirely separate course of training at the College for Provincial Service probationers. Local Governments were consulted on the advisability of adopting this suggestion and proved unanimous in favour of it. Accordingly the Government of India, with the sanction of the Secretary of State, instituted the new course in November 1912. The new system could not be operated without some addition to the staff, and three additional Instructors' charges for Imperial Forest Service Officers were created, while one Assistant Instructorship manned from the Provincial Forest Service came under reduction. This increase in the educational activities of the College coincided with a period of development on the research side of the work of the Institute. Progress had been continuous since 1906, and in 1910 it had been found necessary to create four temporary non-gazetted posts of assistants, two to the Silviculturist and one each to the Economist and Botanist. The sphere of the Institute's activities had widened; new investigations were continually being started; and a definite connection had been established with local forest officers, with railway engineers and with the commercial world. It became increasingly obvious that the existing accommodation and scientific equipment were alike inadequate; and in 1914 it was decided to erect a large building surrounded by laboratories and workshops which would prove equal to the demands likely to be made upon them for many years to come. In accordance with this decision the buildings at Chand Bagh were erected, and for several years the work of the Institute and College was carried on there.

7. The period 1914 to 1918.—The period of the Great War was marked in India by a rapid development in the utilisation of its forest resources, and great stimulus was given towards rendering the country less dependant on foreign supplies. The necessity for extending the scope of the Institute's work yet further was fully recognised; but the financial stringency of the time rendered any large increase in expenditure impossible. More permanent assistants were, indeed, appointed to the staff of the Institute; but it was not possible to fill immediately, owing to the necessity for economy, the two posts of Imperial Assistant to the Forest Economist and Imperial Assistant to the Forest Botanist which had been sanctioned by the Secretary of State in 1915. One of these posts was, indeed, abolished in 1916 on the creation of two posts filled by Indian Assistants. The period 1914-1918 was one which, while it contributed little to the actual development of the Institute, made manifest the need for development and drew attention to the many problems which had to be solved if the forest resources of India were to be exploited to their full extent.

8. The New Institute.—In 1918 the report of the Industrial Commission stressed the need for expanding the Institute in order to meet the rapidly increasing demands of the country; it characterised the equipment of the Institute as wholly insufficient and pointed out the necessity for increasing the number of research officers. The view of the Industrial Commission was strongly supported by the Board of Forestry which, meeting at the end of March 1919, made the further recommendation that a

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large area in the neighbourhood of Dehra Dun should be acquired and new buildings erected sufficient to provide for all present and future requirements of the Institute. The Government of India, therefore, with the approval of the Secretary of State, decided to strengthen the staff of every branch of the Institute, (and especially of the Economic Branch, which was to devote itself primarily to utilisation work) ; to establish the Institute on a new site in new buildings ; and to equip it with the most modern apparatus. The main divisions of the Institute, comprising the Silvicultural, Botanical, Zoological (or Entomological), Economic and Chemical Branches, were not altered, but the staff of each Branch was largely increased and the Branches themselves were sub-divided into Sections, wherever a marked differentiation of functions made such a division desirable. The greatest development was that of the Economic Branch. In 1919 it was staffed by two Imperial Forest Officers holding the posts of Forest Economist and Assistant Economist respectively, and by a temporary Tan Expert. To these were added the posts of Wood Technologist and Minor Forest Products Expert, to be held by Imperial Forest Service Officers, and the posts on temporary establishment of Pulp Expert, Engineer Mechanic, and Expert Wood Worker ; and within a year sanction had been given to making Seasoning, Timber Testing and Wood Preservation the charge of special Sectional Officers working under the Forest Economist.

The existing accommodation at Chand Bagh, which, it had been hoped, would be sufficient for many years to come, was found inadequate to meet the demands made upon it by an Institute whose activities were to be expanded in the way proposed. It was decided, therefore, to acquire an area of some 1,200 acres two miles away from the town of Dehra Dun. There were many reasons for acquiring so large an area ; houses for the staff could be built near enough to the Institute to be convenient and far enough away to leave the immediate surroundings of the Institute spacious and unencumbered ; room for any possible future expansion would be available ; and it would be possible to start a demonstration forest near the Institute itself. The site was acquired and building operations started immediately.

9. The Development of the New Institute.—The first buildings erected were the workshops for the Economic Branch which included a saw mill and wood workshop, a timber testing workshop, seasoning kilns, an experimental wood preservation plant, a pulp and paper plant, and the necessary offices and godowns. These were practically completed by the end of 1922, but they were only opened, after machinery had been installed, in the year 1923-24. Since March 1924 the work of the Economic Branch has been in full progress in its new quarters, and the only check to its development was the closing down of the Minor Forest Products Section from the end of 1922 to April 1926. The Section of Tans was also abolished in 1923 owing to shortage of funds at the Institute and the general slump in the tanning trade. The other Branches too were transferred to the new Institute as accommodation became available, and the Chemical Branch is the only one which is still located at Chand Bagh.

In February 1921 a large increase in the staff of the Economic Branch was sanctioned, and ten posts of Assistant were added ; it was also arranged to train certain of the senior Assistants abroad so as to enable them to take charge of Sections after a few years. Other posts were also added outside the Economic Branch and the degree of expansion which

the Institute has now attained may be judged by reference to the table in Appendix I which shows the present constitution of the staff of the Institute.

Only two other changes in the last decade need be mentioned. The first concerns the educational side of the Institute's activities. In 1926 it was decided to inaugurate at the Institute a course of instruction in forestry up to the standard required for the Indian Forest Service. The training is supervised by the President of the Institute assisted by a Professor of Forestry. The evacuation of Chand Bagh left the buildings there available for housing the students and the teaching staff, and the first course commenced in November 1926. The Institute buildings were considerably altered to make them suitable for a College. At the same time it was decided to discontinue the two years' Provincial Forest Service course which had started in 1912 and that of 1926-28 was the last one held. The second change referred to was also made in 1926. The Retrenchment Committee presided over by Lord Incheape had recommended the abolition of the post of Inspector General of Forests but the Government of India felt the need for an expert of experience and standing to advise them on forestry matters. They therefore made a compromise by amalgamating the posts of President of the Forest Research Institute and College with that of Inspector General of Forests ; and to aid the President in his work they appointed a Vice-President who would also hold the post of Professor of Forestry the most important instructional post in the re-organised Institute and College.

10. Expenditure on the Institute.—Such, in outline, has been the history of the Forest Research Institute and College since its inception in 1906. Not all the new buildings have been completed ; but the Central Building is now finished and stands out a solid and imposing landmark for all the country round. The total expenditure on the new Institute will come to over a crore of rupees ; and the annual expenditure on the maintenance of the buildings and staff will be between ten and twelve lakhs of rupees.* These are large sums of money ; but it has been ensured that the activities of the Institute will not be limited in the future, as they were, to some extent, in the past, by inadequacy of equipment or exigencies of space.

*This sum includes expenditure on the Indian Forest Service and Rangers' Colleges.

CHAPTER IV.

CONTROL OF THE INSTITUTE.

(A).—*External.*

11. **The Board of Forestry.**—We have considered with care the possibility of establishing some suitably constituted body which might help in directing the activities of the Institute from outside. Ultimately responsibility for the control of the Institute must rest in government ; but no government department can supply the scientific or technical knowledge necessary either for directing the work of research in detail or for making a correct estimate of the value of that work. At present the only outside influence which is brought to bear on the Institute is that of the Forestry Board. The constitution and functions of this Board have been outlined in para. 6. The last meetings of the Board were in 1919 and 1925. At the meeting of 1925 it was decided that the Board should meet every three years, or more often if necessary, and should consist of the Inspector General of Forests, the President of the Forest Research Institute and one representative from each of the Governors' provinces. The proposal that the Board should form an Advisory Committee to assist the President of the Institute was also approved. At the meeting of 1925 several matters were discussed which were of interest and importance to the Institute, and there is no doubt that the Board has proved of use in defining the relations between the central Institute and the Provincial Forest Departments and in suggesting methods by which they could be of mutual assistance. At the same time it cannot be held that the Forestry Board is capable of fulfilling all the functions of a really efficient Advisory Committee. It does not meet often enough ; and it is, from the very nature of its constitution, only qualified to deal with that branch of the Institute's activities which is concerned with forestry proper. Even if it did meet more often, its members would doubtless be the first to agree that its outlook would be enlarged and its utility increased if it contained members with that scientific, technical or commercial knowledge which would enable them to criticise with greater effect these aspects of the activities of the various departments of the Institute ; and it is from this point of view that the President would most welcome helpful advice.

12. **The Constitution of an Advisory Board.**—It may happen in the future that the greater independence of Provincial Forest Departments will involve some reduction in the degree of contact between the central Institute and the Provinces. In such circumstances the creation of an Advisory Board, meeting at least once a year and representing provincial interests, would certainly be desirable. It may happen, too, that the President of the Institute will feel the need for outside advice before establishing new sections or inaugurating schemes of research which involve large sums of money. There is also the possibility that Government, before sanctioning new and elaborate proposals originating in the Institute itself, might be anxious to obtain some independent opinion on their value. In view of these possibilities we suggest that consideration might be given to the expediency of establishing in the future an Advisory Board which would both assist the President in determining the general policy of the Institute and aid Government in discharging its responsibilities for the effective supervision of work there.

The Board would be empowered to enquire into the financial and administrative activities of the Institute ; it would approve annual programmes of work ; it would recommend the budget estimates and it would advise on and criticise the general policy of the Institute especially in connection with the adoption of new research projects. We suggest that the Board might be composed of the following members :—

The Secretary of the Department of Education, Health and Lands.

The Inspector General of Forests or the President of the Forest Research Institute,

Two Conservators from Governors' Provinces,

A representative of the Railway Board,

A scientist nominated by the Government of India,

A member of the Indian Associated Chamber of Commerce, and

A member of the European Associated Chamber of Commerce.

Ministers of Forests in provinces where forests are transferred might also be invited to join the Board.

We do not desire to define too closely either the composition or constitution of the Board but, generally speaking, our idea is that representatives should be selected from various provinces in rotation and that, with a view to continuity of policy, seats should be vacated at intervals of either two or three years. A Board so constituted could give helpful advice from an independent viewpoint on both departments of the Institute's activities—the one which deals with forestry proper and the one which deals with the utilisation of timber and other forest products. We are convinced however, that the Board can only be of real use if its membership is small, if it represents adequately the interests of forestry proper as well as of science and industry, and if it meets at least once a year. If these conditions are not fulfilled the Board might be a cumbrance rather than a help to the President of the Institute and its *raison d'être* would disappear.

(B).—Internal.

13. Control by the President of the Forest Research Institute.—The need for harmonious relations between the Institute and the controlling Government department is obvious. If they understand each other's problems, mutual sympathy and tolerance will be the result. But the relation in which they stand to each other involves certain difficulties. The similarity between research work and artistic work is not always realised. In the nature of things it is almost as difficult for a public department to carry on research as it would be for it to produce literature. Both forms of creative effort are impatient of regulation or control. In both the main desideratum is the utmost possible liberty for the artist ; and this every public department of its very nature abhors. We are strongly of the opinion that the best way for a government to assist research is to get a good man and trust him to carry on the work with the minimum amount of interference or control.

We understand that the President of the Institute is entitled within limits, provided he does not overstep his budget or incur any commitments for future years, to sanction expenditure for staff or apparatus. We are of the opinion that this system should be extended as far as is constitutionally possible and that the necessity for reference to the department, with the inevitable delays which this involves, should be reduced to an absolute minimum. We understand that the advice of the President is always taken before staff is to be engaged and we are of the opinion that this arrangement should continue. One cannot expect the Head of an Institute to inspire, or accept responsibilities for, research work if he does not believe in the men who are working for him.



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CHAPTER V.

ORGANISATION OF THE INSTITUTE.

14. The President and Vice-President of the Forest Research Institute.—It has been represented to us that the present administrative machinery of the Institute is inadequate in several respects. It is said, in the first place, that the amalgamation of the posts of Inspector General of Forests and President of the Forest Research Institute has operated to the detriment of the Institute's best interests. The responsibilities of the President of the Forest Research Institute are heavy ; it is his duty to control the whole of the work in progress in the various Branches of the Institute ; to examine the accounts of his own and other offices ; to control the establishment and administer the estate of the Institute ; to carry on correspondence about forest research with all parts of the world ; to examine and authorise publication of all literature issued by the Institute ; to examine and criticise all working plans submitted to him, and generally to inaugurate, and direct the development of, particular lines of research. In addition to these duties he has to supervise the administration of the Rangers' College and the Indian Forest Service College. In the performance of these multifarious duties the President of the Institute is assisted by the Vice-President ; but the Vice-President is himself Professor of Forestry at the College and it is regrettable that half the time of a highly paid and experienced forest officer should be devoted, as it is at present, to the routine work of the President's office. The main objection urged against the present system is that the duties enumerated above cannot be satisfactorily performed by a man who, as Inspector General of Forests, must tour extensively in the provinces ; and it is clear that the dual responsibility, constituted as it now is, cannot be adequately discharged by one man.

15. Lack of scientific control in the Institute.—Consideration of the objects which a Research Institute must have continuously in view and of the means which it must adopt to achieve those objects leads us to think that the controlling elements in the organisation of the Institute are not at present ideally constituted. The work of the Economic Branch is largely technical and the activities of the different Sections within that Branch are highly specialised. Unless there is some controlling authority which will limit and define the scope of individual investigations and co-ordinate the work of the different Sections, it is probable that effort will be wasted, unnecessary expense will be incurred, and confusion will ensue. Sections will concentrate more and more closely on the particular problems associated with their own work and will lose touch, to an increasingly greater extent, with the work of other Sections ; it is possible moreover, that they will adopt wrong methods of attacking new problems or will be led into investigations which have no immediate relevance to the task actually entrusted to them. The Forest Economist, as Branch Officer, is supposed to direct and control the Sections under him. But the Forest Economist must be a forest officer, with practical experience of forest conditions and with a knowledge of the methods and costs of extraction and other considerations which affect the possibilities of utilising timber for commercial or industrial purposes. It is impossible to expect such a man to have the detailed scientific knowledge necessary for the control, on the technical

side, of the Sections under his charge. It is equally impossible to expect from the President of the Forest Research Institute, a man whose life has been spent in administrative posts in the Forest Service, such exceptionally high scientific qualifications as would enable him to supervise efficiently the work of the Sectional heads in the Economic Branch. We have little doubt that the work of the Institute would have gained in value in the past, as it will in the future, by the appointment of a man of high scientific qualifications to whom the various officers could turn for advice in attacking the problems which inevitably present themselves in the course of investigations, and whose function it would be to see that research was being undertaken on scientific lines. We have little doubt too that the Branches on the Biological side would gain if there were some eminent scientist on the staff of the Institute who could give advice as to the lines on which work should proceed.

16. The appointment of a Director of Research.—These considerations have led us to the conclusion that the appointment to the staff of the Institute of some scientist with outstanding qualifications is most desirable. We have given careful thought to the possibility of appointing such a man President of the Forest Research Institute. The separation of the posts of Inspector General of Forests and President of the Forest Research Institute would provide the simplest solution of the difficulties which we have mentioned in para. 14. This separation was in force up to 1926, but on the recommendation of the Inchcape Committee the Government of India, in their despatch No. 7, dated the 12th August 1926, substituted the present system. The main consideration which influenced Government in making the change was that the duties of the Inspector General of Forests were not in themselves sufficient to occupy fully the time of that officer. We see in the future no prospect that the duties of the Inspector General of Forests will grow more arduous or more numerous, and we would not wish to change the present system except for the most cogent reasons. There are, indeed, advantages in retaining the Inspector General of Forests as President of the Forest Research Institute. The Institute must remain in the closest touch with the forest services; its work must be known to and command the respect of forest officers as well as of industrial concerns; and the appointment of any but a Service man to the post of President of the Forest Research Institute might endanger the present happy co-operation between the Institute and forest officers working in the provinces. It may happen, however, that, at some period in the future, the administration of Forests will be transferred to provincial Governments and the post of Inspector General of Forests abolished. Under such circumstances we see no reason why, if no senior forest officer with suitable scientific qualifications were available, the Director of Research, whose appointment we are recommending, should necessarily be debarred from holding the post of President. But such an appointment would be conditional on his having shown, as Director of Research, that he possessed a broad and sympathetic outlook and was capable of maintaining friendly relations with all. To have the work of the Institute stigmatised as academic and unpractical by the forest officers would be fatal to its utility. A scientist appointed President of the Forest Research Institute would have to dissolve many doubts in many practical minds before full confidence was established that the true interests of forestry had been safely committed to his

charge. There is no doubt, however, that the association of a scientist with a forest officer in the direction of the Institute would ensure in the control of the work itself the proper representation of its two main aspects. The forest officer knows the forests, and he knows the difficulties which are found both in the culture and the utilisation of timber and other forest products. His task is to outline the problems with which forestry is faced ; the task of the scientist is to solve them. Neither can succeed without the co-operation of the other ; and it is our hope that the association in the direction of the Institute of two men, each distinguished in his separate vocation, will promote alike the interests of the Economic and the Biological Departments of the Institute.

We recommend, therefore, that a Director of Research be appointed to the staff of the Institute. His function in relation to the Institute would be that which the Institute itself performs in relation to the provinces " to deal with the more strictly scientific portion of research and in general to guide and co-ordinate investigations ". The Director of Research would be subordinate to the President of the Forest Research Institute, but he would be given the greatest freedom in the direction of the work of the Institute so far as its scientific aspect was concerned. Harmonious co-operation between the Director of Research and the President of the Forest Research Institute would be essential to the success of our proposal. We do not despair of the possibility of such harmony ; on the contrary, we expect it. But the selection of an individual to fill the post of Director of Research would have to be made with the greatest discretion. He would have to be a man not only eminent as a scientist but endowed with such personal qualities as would enable him both to work in the most friendly co-operation with the President of the Forest Research Institute, and to temper and direct the enthusiasms of Sectional heads without offending their susceptibilities. The work of the Director of Research would, we anticipate, be largely concerned with the Economic Branch of the Institute ; and we consider that a man who has made a special study of the physical aspects of chemistry or the chemical aspects of physics would be best qualified to hold this post. The post should be tenable, in the first instance, for a period of three years, after which it should be made permanent. The salary attached to it should commence with at least Rs. 2,500 per mensem. It is possible, perhaps probable, that no suitable candidate will be immediately available. The appointment of an unsuitable person would, we believe, be most injurious to the interests of the Institute ; and, in our opinion, it would be better to postpone the appointment till the right man is available. The scientific attainments and personal qualities of the holder of this post are so important that we recommend that, before making an appointment, the Public Service Commission be asked to take the advice, through the High Commissioner, of the Council of the Royal Society and the Advisory Council of the Department of Scientific and Industrial Research.

17. The appointment of a Personal Assistant to the President of the Forest Research Institute and abolition of the post of Vice-President.—Whether a Director of Research is appointed in the first instance or not, we recommend the abolition of the post of Vice-President of the Institute. Education should not, we consider, be included amongst the activities of the Institute, though we approve of the present system whereby the services of officers of the Institute are used for giving lectures at the College. The Institute and the College should be administratively separate and the

College should have a separate Principal under the Inspector General of Forests. Certainly the present anomalous position whereby the Vice-President's activities are divided between his educational work at the College and his work in the office of the President of the Forest Research Institute should be discontinued. We therefore recommend the creation of the post of Personal Assistant to the President of the Forest Research Institute. We were at first of the opinion that the administration of the whole Institute should be under the Director of Research, and that the Personal Assistant should be attached to him. But we have come to the conclusion that the Director of Research would be able to devote his attention more exclusively to scientific matters if he were relieved of responsibility for the administrative work of the Institute and did not have his time taken up with the performance of routine duties. The possibility of friction would also be reduced if responsibility for the administrative and scientific control of the Institute were separately apportioned. The post of Personal Assistant should normally be filled by an officer of the Indian Forest Service with several years' experience. All the administrative work connected with the Institute, and especially that connected with the management of the estate, would be performed by him subject to the control of the President. The administrative control of the Institute should, we have said, remain in the hands of the President; but any question affecting the work or the efficiency of the Branches should be referred by the Personal Assistant to the Director of Research, though there would be no need, unless the Director of Research especially wished it, to refer questions of mere routine. The main advantage of this proposal is that, when the President of the Forest Research Institute was away on tour in the capacity of Inspector General of Forests, the work of the Institute would not suffer in any way. The Director of Research would continue to control the work of the Institute on the scientific side, and the Personal Assistant would attend to all administrative details. The management of the Central Office, the formation of which we recommend below, would also be in the hands of the Personal Assistant.

18. Centralisation of Branch Offices.—The heads of all Branches have brought to our notice the disproportionate amount of time which they are compelled to devote to routine work in their offices. Officers engaged in research work should have as few distractions as possible, and though a certain amount of office work is inevitable, we consider that it should be reduced as far as is compatible with efficiency. The present system under which each Branch (except that of the Chemist) has an office of its own and deals with all correspondence, files and accounts independently of other Branches, is uneconomical and involves extensive duplication of work. The centralisation of offices would help to establish that close touch between Branches which it is our aim to encourage in every possible way. The advantages of a Central Office which would act as a distributing agency and would also dispose directly of all matters which did not demand the personal attention of the heads of Branches or Sections are obvious. Only two questions have exercised us in any degree. The first is whether the office of the Forest Economist should remain independent of the Central Office or not. The work of the Forest Economist's office far exceeds in bulk that of the other offices; it is different, too, in quality, as the task of the Forest Economist is largely to answer technical enquiries concerning the work of the Sections under him. We do not consider, however, that the difference in the nature

of the correspondence carried on by the Forest Economist justifies the retention by him of a separate office. His correspondence could be handled equally well by a department in the Central Office specially devoted to the purpose ; and the connection of this department with the Central Office would be wholly beneficial. There is no reason too, why the Central Office should not be located near the Economic Branch. The other question which we have considered is whether the accounts of the whole Institute should be made up in one office or whether they should be dealt with separately by Branches as is at present the custom. The accounts of the Economic Branch are again the largest and most complicated ; but we have little doubt that the centralisation of the accounts work of all Branches would entail great advantages. The sums involved annually amount to several lakhs of rupees ; and we consider that some trouble might be saved if an accountant were specially delegated from the Accountant General's Office to deal with this work. We therefore recommend the amalgamation of all Branch Offices with that of the President of the Forest Research Institute, and the formation of an Accounts Office, attached to the Central Office, which will deal with the Accounts of the whole Institute. The management of this Central Office would be in the hands of the Personal Assistant to the President of the Forest Research Institute, and the officer delegated from the Accounts Office would work under his general supervision.

19. The Forest Economist and Utilisation Work.—The appointment of a Director of Research will ensure that the work of the Institute is controlled on its scientific side and we do not think that the detailed supervision of the work of his Sections by the Forest Economist will be so necessary in the future. The Forest Economist has, at present, to combine in himself the most varied abilities. He must supervise, on the scientific side, the highly specialised work of his Sections ; he must co-ordinate their various activities ; he must control them on the administrative side of their work ; and, most important of all, he must act as publicist and utilisation officer for the Institute, as it is to his Branch that all enquiries from the Railways, the Public Works Department, timber merchants and industrialists in general come for disposal. The work of the Forest Economist as a publicist has been strictly limited in the past by the exigencies of his other duties. He would have been neglecting his responsibilities at the Institute had he been frequently on tour in the Provinces ; and he has been compelled to do a great deal of work by correspondence which could have been done by personal intercourse with greater efficacy and with greater benefit both to the Institute and industry. The importance of the work done by a Utilisation Officer we consider paramount. It was recognised in the Report of the Imperial Economic Committee on Timber which says* : “ An interesting feature of the organisation at Princes Risborough is the presence on the staff of a special officer whose duty it is to be in constant touch with the timber market and with the users of wood and generally to act as a liaison officer between the scientific staff and the timber-using industries. He is described as a “ timber utilisation ” officer. An extension of the Forest Products research laboratory to enable it to deal freely with Empire timbers would probably necessitate the appointment of a second timber utilisation officer. We should consider this appointment an important part of our proposals in regard to Princes Risborough. If it ever became necessary to appoint yet further utilisation officers to devote their whole time to the timbers either of a single Empire country or of groups of

*Para. 87 : Report of the Imperial Economic Committee on Timber ; August 1928.

countries, we consider that the cost should be borne by the country or group of countries requiring that service". The Royal Commission on Agriculture in India* was equally emphatic on the desirability of appointing special agencies for the exploitation of forest products with a view to industrial development, and they recommended the appointment of a forest utilisation officer in every province.

It appears to us that the appointment of an officer at the Institute to do the work of utilisation is an urgent necessity. The Sections of the Economic Department are particularly concerned with investigations which interest and affect the timber trade and the general public; and we consider that the Forest Economist who is familiar with the work of those Sections and under whose nominal control they would remain, is the most suitable person to do the work of utilisation. The new duties of the Forest Economist will be to interest the public in forest products, to supply information of every possible kind, to travel all over India and meet representatives of firms interested in forest products, and generally to act as a medium of communication between the forest department and the public. The Forest Economist should normally be a Forest Officer and should be retained in the post as long as possible, for his utility will increase with his experience. When a vacancy occurs in the post the head of a Section with forest experience or the utilisation officer from some province could suitably be appointed.

20. Personal Assistant to the Forest Economist.—The duties of the Forest Economist as a utilisation officer will necessitate his being on tour for a large part of the year, though he must be at the Institute for several months in the year to familiarise himself with the progress made in the different Sections in his Department, and to acquaint the officers of the Institute with the views of the public and the requirements of the timber trade as they have been formulated to him. The control of the Sections of his Department on the scientific side will be in the hands of the Director of Research. We recommend that, in place of the post of Assistant Forest Economist as now constituted, the post of Personal Assistant to the Forest Economist be created. The Personal Assistant would be responsible, in the absence of the Forest Economist, for the supervision of the Sections on the administrative side. By this system the work of the Sections would proceed smoothly even in the absence of the departmental head.

21. Transitional Scheme.—We have recommended the abolition of posts of Vice-President and Assistant Forest Economist, and the creation of the posts of Director of Research, Personal Assistant to the President, and Personal Assistant to the Forest Economist. At the same time we have stressed the inadvisability of appointing a Director of Research until a person suitable in every respect is found. Whilst we have every hope that a person with the necessary qualifications will eventually be found we cannot pretend to any confidence that such a person will be immediately available, and we are unwilling that delay in appointing a Director of Research should involve the postponement of our other proposals. If no suitable candidate offers himself for the post of Director of Research we suggest that the following temporary arrangement be adopted:—

The posts of Personal Assistant to the President of the Institute and Personal Assistant to the Forest Economist should be filled, and the post of Vice-President abolished. The present head of the Timber Testing Section should be appointed Assistant Forest Economist, with power to supervise and control, on the scientific side, the work of all Sections in the Economic Department. Some such temporary and transitional provision we consider essential if any delay occurs in the appointment of a Director

*Para. 224: Report of the Royal Commission on Agriculture in India, 1928.

of Research. At the head of several Sections there are now young Indian officers carefully trained and prepared to take responsibility. They will be in independent charge of their Sections and will be responsible for the work done in these Sections. But we consider it desirable that there should be someone at the Institute with more general experience whose name will carry greater weight outside. If Mr. Seaman, the head of the Timber Testing Section, had been an expert only, we should not have suggested the retention of his services. But he is a man, not only intimately conversant with the work of the Timber Testing and Wood Technology Sections, but of general scientific knowledge, with outside experience, well capable of directing and co-ordinating the work of several Sections without restricting the independence or affecting the sense of personal responsibility of the heads of those Sections.

If such an arrangement is necessary and can be made, we believe that it would be of the greatest practical value, both in promoting efficiency and in safeguarding the best interests of the Institute. Diagrams explaining the proposed changes are attached in Appendix II.

22. Grades of Assistants.—The present grading of the various Assistants, Computers, Moisture Determinators, Machine Operators and other members of the staff of the Institute is unsatisfactory. Members of the staff are placed in certain grades with a fixed rate of increment, and in those grades they must remain till their term of service expires or better prospects lure them away. We realise that the development of the Institute has been rapid and that the continual creation of new posts or the appointment of new men with varying qualifications has led almost inevitably to the present situation; but it appears to us that a stage has now been reached when the position can with advantage be reviewed, and a new, carefully planned system be established which would give every man an incentive to increase his utility and secure promotion. We do not consider the present rates of pay inadequate; some, for example the initial pay of Upper Grade Assistants, we even consider unduly generous; but it is necessary not only to attract but to retain the best men, and we consider this impossible under the present scheme. We recommend the constitution of a number of grades on definite scales of pay so related to each other that promotion from one to the other would be the normal method of filling vacancies or recognising ability. Promotion would be by selection and not by seniority. Selection would be on grounds of merit alone, and while the uninspired routine worker would rise automatically to the top of his grade and remain there, men who showed special ability would have every opportunity of rising to better paid and more responsible positions. We believe that the introduction of such a system would promote a healthy competitive spirit amongst members of the staff and would ensure that the work in the lower grades of the Institute was inspired by a greater degree of enthusiasm. In determining the mutual relation of these standard grades and in formulating the scales of pay attached to them, due regard would have to be paid to the claims of the members of the present staff. But we do not anticipate that there would be any insuperable difficulty in fitting the existing posts into a new scheme. We have not thought it part of our duties to work out such a scheme in detail, but we attach (in Appendix III) an outline which was suggested to us and which might form a suitable basis for more detailed examination. We are of opinion, however, that the scales of pay suggested for the higher grades should be carefully scrutinised and that facilities should be freely afforded to really good men for more rapid promotion through several grades.

CHAPTER VI.

RECRUITMENT AND TRAINING.

23. Special qualifications necessary for Research.—Before discussing the methods of recruitment to the staff of the Institute which have been adopted in the past, and before suggesting any improved scheme, we wish to emphasise the fundamental distinction between research and administrative work. Research at the Institute is not of the type which discovers new principles of general application, but of the type which applies known principles to new material in the hope of making some discovery of economic, and perhaps of scientific, value. But research, whether operating in the realm of pure or applied science, demands imagination and the ability to extract a principle or derive a law from a mass of observations. To be successful it demands, more than any other kind of work, highly trained and specialised men. A formula or law evolved from insufficient or faulty data, even a single mistake in calculation, may entail the wreckage of a whole project. The publication of results arrived at from consideration of erroneous data may do incalculable damage to a commercial enterprise which has staked its future prosperity on the accuracy of those results. Administrative work normally demands neither such specialised training nor such meticulous accuracy. Any reasonably intelligent person can be made into an administrator; only a small fraction of humanity could ever do the work of research. It differs from the work of administration as does the work of a portrait painter from that of a house painter: The qualities of mind, the outlook, the training it demands are all different; and unless a suitable person is found to do it, it were better left undone.

In view of the unique nature of the work of research and the exceptional qualities it demands in those who undertake it, we believe that the Institute can only prove of value in the future if its staff is recruited by methods of strict selection from suitable candidates.

24. Past method of recruiting Upper and Lower Grade Assistants.—In the past, as each post of Upper Grade or Lower Grade Assistant fell vacant or was created, special recruitment was made to fill that post, and the most suitable candidate was appointed without regard to his capacity for adapting himself to other kinds of work or eventually rising to a position of greater responsibility. Each Assistant was placed in a grade, with a fixed scale of pay, without any hope of promotion to a higher grade or of transference to a similar grade in another Section where work might be more congenial. As a result the most promising Assistants, deprived of the chance of self-advancement, are continually tempted to leave the Institute to take up other posts with more favourable prospects. Such a system is obviously unsatisfactory: It leads to discontent amongst Assistants themselves: It deprives the Institute of the services of the most promising members of the subordinate staff; and research itself must suffer when the heads of Sections are compelled to give so much of their time to the training of newly recruited Assistants in the highly specialised work which they have to undertake.

25. Past method of recruiting Imperial Assistants.—Above the Upper Grade Assistants in certain Sections of the Economic Branch are Assistants, or Imperial Assistants, as they are sometimes called. These men were specially recruited with a view to their taking over charge of the Section to which they were attached when they were sufficiently trained. We do not wish to call in question, in any way, the abilities or qualifications of

those Assistants who have already been selected ; some method of direct recruitment was necessary in a transitional period, and the Institute can congratulate itself on having engaged men of considerable promise ; but we believe that this method of recruitment should be discontinued in the future. In principle, we consider it undesirable that any person, however distinguished his academic career may have been, should be placed under the head of a Section for training in research work on the definite understanding that, in the course of a few years, he will take charge of that Section. Research demands exceptional qualities of mind, and the charge of a Section lays on its holder many and great responsibilities. Only after he has done a considerable amount of work at the Institute itself can it be satisfactorily determined whether a man possesses those qualities which will enable him both to direct the work of a Section on scientific lines and to undertake the responsibilities inseparably connected with the administration of a large staff. In practice, too, it is unjust to the individual to appoint him on the understanding that he will be promoted to the charge of his Section when he is competent to carry on the work independently, and then to postpone his promotion on the grounds that he is not, and perhaps never will be, competent to carry on the work without impairing the reputation of the Institute. Under such a system the rights of the individual and the interests of the Institute must inevitably come into conflict.

26. Proposed new method of recruitment.—Under the system which we propose, any post, as it falls vacant, will be filled by selection from men already on the staff of the Institute. Initial recruitment to a grade equivalent to that in which Lower Grade Assistants, Head Computers, etc., are now placed would take place in the following manner:—

Two or three graduates with recognised degrees would be selected by the Public Service Commission from amongst candidates for the post. These graduates would be given probationary scholarships (of a maximum value of Rs. 150 per mensem) tenable for one year, and would be given work in some Section at the Institute. These scholarships would be given on the clear and definite understanding that they were probationary only and did not give their holder any right to permanent employment on the expiration of the probationary period. At the end of the year, the President of the Forest Research Institute would consider reports on the work of the probationers and would select one only for further probation and training. Those not selected would either leave the Institute or be appointed to such subordinate positions on the staff of the Institute as the President thought fit. The man selected would undergo another two years' probation, being placed in an appropriate grade on a definite scale pay (e.g., Rs. 150—5—200). During these two years he would do further work in a Section, and would, on the recommendation of the President of the Forest Research Institute, be sent on an eight months' course to the Indian Forest Service College, in which course there would be included several months of actual touring in the forests. In special cases it may be desirable to attach the probationer to some forest division for further training. The object of this provision is to ensure that, when posts fall vacant in those Sections where the work can only be done efficiently by men who have some experience of actual forest conditions, there would be, amongst the Assistants in the various grades, men with the requisite experience from whom selection could be made. On the completion of these two further

years the probationer would be made permanent at such a scale of pay in such grade as the President of the Forest Research Institute thought fit.

27. Candidates who have taken the Forestry Course at the College.—Preference in the selection of probationers should, we consider, be given to those candidates who have taken a Forestry course at the College in a private capacity, and who also have the necessary scientific qualifications. The fact that they took the course on their own initiative would be evidence of their predilection for work in connection with forests ; and there would be the additional advantage that their character and ability would already have been gauged with sufficient accuracy to determine their suitability or otherwise for selection. Nor would we wish, by our proposed system, to exclude from direct appointment those members of the Provincial Forest Service who have completed a course of Forestry at the College and have shewn that they possessed a scientific outlook and a bent for research.

28. Interchange between Sections.—We consider it most important that Assistants, of whatever grade, should be freely interchanged amongst the different Sections whenever a suitable opportunity occurs. It is true that the work in the various Sections differs in its nature ; but the general principles underlying the work are not so dissimilar as to make this interchange impossible. Such interchanges we consider both necessary for the adequate training of Assistants and desirable as promoting closer touch between the Sections themselves. An additional advantage, too, is that they would provide Assistants with further avenues for promotion.

29. The proposed system in practice.—The proposed system would, we anticipate, operate in the following way if it is fully established : When the Head of a Section retires, his place would be filled by an Assistant either from his own or some other Section. The place of that Assistant would, in turn, be filled by another Assistant from the same or a lower grade working in either the same or a different Section. The charge of a Section would almost inevitably be taken by an Assistant in that Section ; but the less specialised and technical the work of any post was, the greater would be the possibility of filling it from another Section. In individual cases it might happen that there was no person on the staff of the Forest Research Institute capable of discharging adequately the responsibilities of a particular post. In such cases direct recruitment would have to be made from outside ; but such recruitment should only be made in the last resort, and we believe that, if the proposed scheme is adopted in the immediate future, no such contingency should arise.

30. Conditions of selection.—We have explained that research work is of such a nature that it can only be undertaken successfully by men with special qualities of mind who have been carefully trained over a period of years. We attach the greatest importance, therefore, to the initial selection of suitable candidates. Every candidate will have the opportunity of rising to the highest position, and only those candidates should be selected in the first instance who give promise of developing the necessary ability. The President of the Institute, moreover, must have absolute power to dispense with the services of those probationers whose work does not come up to the standard of proficiency required.

We hope that, in a few years' time, there will be, distributed amongst the various Sections in different grades, a number of Assistants anxious to rise and capable of rising, to posts to which they cannot now aspire. But promotion must be by merit alone. On this we insist with all the emphasis

at our command. Our proposed system will be not only useless but pernicious if the principle of selection by merit alone is not adhered to most rigidly. The reputation and the value of the Institute depend entirely on the reliability of the men to whom the work of research is entrusted ; a man's generosity to his own impressions in selecting and interpreting results may lead to the promulgation of faulty theories ; and inefficiency on the part of a single officer in a responsible post may do grave damage to the reputation for sound and trustworthy work which it is the task of years to establish and without which no Research Institute can be of any practical value. We should not have proposed this scheme if we did not earnestly hope that no racial or communal considerations of any kind whatsoever should affect detrimentally the opportunity for selection or promotion of those persons whose intrinsic abilities have made them worthy of it. It is particularly important in the case of a Research Institute that this principle should be followed ; unless it is adhered to strictly any scheme of recruitment must prove futile.

31. Recruitment of experts.—One of the advantages of the proposed scheme is that it obviates the need for recruiting experts at frequent intervals. Within a short period of time young Indians, trained at the Institute and abroad, will have taken the place of the European experts employed in the past. It will be the task of these young men to train their successors who will, under the proposed scheme, be men specially chosen for their aptitude for research. The recruitment of experts will, however, be occasionally necessary in the future. It will, from time to time, be necessary to start some new and specialised work, and an expert will be needed to initiate the new project and put it on a sound basis. We do not anticipate that any expert would be needed to do actual research work. That is the task of the scientist trained at the Forest Research Institute. But, before the scientist can devise new methods of attacking a problem, he must be fully acquainted with the old methods ; and this knowledge he can acquire with the least waste of time and effort from someone who has had practical experience. Such experts as are required should, we consider, be recruited on short term contracts, as has been the custom in the past ; but it should seldom or never be necessary to renew these contracts, as members of a scientifically trained staff should be well able to pursue investigations independently after a short period of initiation. We consider the present method of selection adequate. The Public Service Commission recruits in India, and the High Commissioner invites applications from abroad. The Public Service Commission seeks the advice of the staff of the Forest Research Institute in appraising the technical qualifications of candidates, and the High Commissioner in London is aided by Forest Experts such as Professor Troup and Mr. Pearson. The names and qualifications of experts in any particular line are well known, and there is no reason to suppose that the present method of selection leaves any field of possible recruitment unexplored.

32. Necessity for immediate adoption of new system.—We recommend strongly that the proposed system of recruitment and probationary training be adopted immediately, so that there may be, as soon as possible, a supply of adequately qualified Assistants to fill the higher posts in the Institute as they fall vacant. The working of the proposed system would be facilitated if there were standardised grades throughout the various Branches and Sections of the Institute (as suggested in paragraph 22 of this Report), but the success of the system is not dependent on the

prior establishment of these standardised grades. Any posts other than those which are to be held by officers of the Forest Service should be filled in accordance with our scheme of recruitment ; and we are firmly convinced that only the strongest reasons should justify a deviation from this method.

33. Necessity for training abroad.—We have stated our view that the system of appointing particular persons as Assistants with the express object of making them eventually heads of Sections, though perhaps unavoidable in the past, will be unnecessary in the future ; and we have suggested methods of recruitment and of interchange between Sections which should secure good men and give them an admirable all round training. The introduction of properly scaled grades and the possibility of rapid promotion through these grades strictly by selection should also give an opportunity to promising men to come to the front. We hope that as a result of the adoption of our proposals the Institute will have been supplied, in a few years' time, with a number of well trained Indian Assistants, some of whom will be qualified eventually to take charge of Sections. But we do not believe that training at the Institute alone is sufficient to give a man the detailed knowledge and wide experience which form the necessary equipment of the head of a Section. Our view is that outside training is essential, and we suggest that a year or two before the post of head of a Section falls vacant, the prospective successor should be sent abroad for such training as has been given in the past to the Imperial Assistants who have already taken charge of Sections.

We consider it desirable that a system of control over young Assistants sent on deputation abroad should be devised. The control of the High Commissioner in London cannot be more than nominal ; and we think that, on their return to Dehra Dun, Assistants should submit to the President of the Institute a detailed account of their work while on deputation. We would suggest that the duty of supervising the studies of these Assistants should, whenever practicable, be delegated to some expert, who, on payment of a small fee, would keep in touch with them and advise the President of the Institute, through the High Commissioner, of their progress. We certainly think that these Assistants should be charged to ask those professors, lecturers or research workers under whom they study to send to the High Commissioner certificates that they have attended properly to their work and reports containing other remarks which may be considered applicable. We are aware that such certificates or reports are not always a reliable guide to a correct estimate of the quality of a student's work ; but the necessity of obtaining them would, at least, prevent flagrant abuse of the privileges and liberties allowed by deputation.

34. Interchange of research workers.—We believe, however, that cheapest and most effective method of providing the necessary outside experience and training would be by mutual interchange of research workers with similar Institutes abroad. We have read with interest the recommendation approved by the Committee on the Organisation of Medical Research* that " Efforts should be made under the Research Fund Association to facilitate the ' interchange ' of workers engaged in laboratory or field work in India with similar workers in England or elsewhere. Men sent home temporarily from India in this way, if carefully chosen, might not only gain much benefit to themselves but do much to attract

*Page 65, Report of the Committee on the Organisation of Medical Research under the Government of India, 1928.

other workers to take advantage of the great opportunities for research that India has to offer". The Royal Commission on Agriculture in India formulated the yet more ambitious scheme of creating a chain of Empire Research stations which would facilitate arrangements for the interchange of visits between research workers in India and those in other parts of the Empire, and might eventually lead to the development of a system of exchange of research workers for definite periods.* Such a system of interchange, facilitated by the grant of scholarships, is already established between certain English and American Universities and has worked to their mutual advantage. We see no reason why a system of interchange of research workers should not be established between the Institute at Dehra Dun and the Institutions at Madison, Ottawa, Princes Risborough and other places abroad. The advantage to Assistants who shewed promise of abilities which would enable them to take charge of Sections would be great. It would save the expense of deputation; it would ensure adequate control of the individual; it would give opportunities of doing practical work under expert tuition, and it would broaden the outlook and enhance the subsequent utility of the Assistant selected. It is possible, too, that the introduction to Dehra Dun of young students from England, Canada or America would stimulate the activities of Sections and inspire fresh lines of thought. We have no reason to suppose that young Assistants would not be welcomed at Princes Risborough and we believe that if the authorities at Madison and Ottawa were approached on the subject, they would not be unwilling to enter into an arrangement which secured for members of their own staff an opportunity of seeing the work which is being done in India. We do not propose that any system of exchange scholarships should be adopted. We would wish the arrangements to be as informal as possible. Whenever it appeared desirable to send a young Assistant abroad for training and experience, the President of the Institute would get into communication with the authorities at the Institutions which we have mentioned, and if they wished to send some member of their staff to India, the exchange could be effected without further trouble. Each institution would pay the travelling expenses and salary of its own delegate who would, on arrival, start work in that Section which was of particular interest to him. It would not be necessary for research workers who were changing places to have worked in exactly the same line, as arrangements could be made at Dehra Dun for such an interchange of Assistants as would leave a vacancy in the Section in which the visitor from abroad was anxious to work. In our opinion it would be advisable for the President of the Institute at Dehra Dun to explore the possibilities of this suggestion without delay, so that any general difficulties may be disposed of before the question of exchanging particular individuals arises. We suggest this scheme not as a vague ideal but as a solution, capable of being put into immediate practice, of some of the difficulties incidental to the training of Indian research workers of the best type.

*Paragraphs 558 and 559, Report of the Royal Commission on Agriculture in India, 1928.

CHAPTER VII.

ORGANISATION—BRANCHES AND SECTIONS.

Silvicultural Branch.

35. Conditions of Central Research in Silviculture.—It has been said that good silviculture is the basis of all good forestry, and we have no desire to question the accuracy of this dictum. We would, however, add that good silviculture will only be possible if there is a co-ordinating centre which maintains the closest touch with the provinces and notifies them, without undue delay, of the results of experiments made elsewhere. This function is admirably performed by the Central Silviculturist, although the amount of research work which can be carried out at Dehra Dun itself is inevitably limited by geographical and climatic considerations, and only a restricted range of investigations is possible there. For silvicultural research the laying out of sample plots and the organisation of experimental and acclimatisation stations is essential; but we do not consider it practical for this work to be done wholly, or even partially, by the Central Silviculturist. Sample plots started by the Institute have already been handed over to the provincial departments for supervision; and we do not consider it feasible to enlarge the staff of the Central Silviculturist to such an extent that local experimental or acclimatisation stations could be under his direct control. The institution and supervision of such stations is properly the work of Provincial Silviculturists and it would hardly be feasible, whilst it would be certainly undesirable, to deprive them of their responsibilities in this respect. At the same time, unless uniform methods of laying out plots, estimating growth and compiling other data from investigations in progress are adopted, such investigations will be of local interest only; the work done in one Province will have to be done again in another Province, and the interests of silviculture as a science will not be promoted. These considerations lead us to think that one of the most important functions of the Central Silviculturist should be, not to carry on local research work himself, but so to co-ordinate the work done in the provinces that the results obtained may be of more than local value. There is yet another aspect of the problem. The duties of the Central Silviculturist must obviously not be confined to the collation of the results of local investigations and the deduction from them of certain general propositions. The value of those propositions is negligible if they are not applied in the actual practice of silviculture and the Central Silviculturist must be in a position to advocate, even though he cannot enforce, improved methods of silviculture throughout the provinces.

36. Relations of the Central Silviculturist with the Provinces.—The relation of the Central Silviculturist to Provincial Silviculturists and the organisation of work at the Institute on the lines best calculated to promote the interests of silviculture in the provinces are subjects which were discussed at the Silvicultural Conference in 1922, and are being further discussed at the Conference of 1929. We cannot contemplate the institution of a system which would give the Central Silviculturist any kind of official control over Provincial Silviculturists; but we suggest that the programmes of Provincial Silviculturists should normally be submitted to the Central Silviculturist for his comments. The Central Silviculturist from his acquaintance with the work being done in other provinces and from his

knowledge of recent developments could point out deficiencies or superfluities in the programmes ; he could make additional suggestions for work which would prove of more than provincial interest and value ; and his inspection of these programmes would ensure the adoption of standardised methods of experiment throughout India. Not less important than the co-ordination of the work of research in the provinces is the speedy application to working plans of the latest conclusions which have been drawn from silvicultural experiments. To achieve this object the scrutiny of all working plans by a central authority is very desirable. Working Plans Officers are not always conversant with the latest developments in silviculture ; and it is not easy for them to keep in touch with the latest methods of estimating yield or growth and of making other similar technical calculations. We have reason to believe that the provincial officers themselves welcome outside advice ; and we think that the practice of submitting working plans for approval to the Inspector General of Forests is one which should continue whether or not the Inspector General of Forests has power to alter them. As long as the Inspector General of Forests is also President of the Research Institute he will be in the closest touch with improved methods of silviculture and will continue to have the advice of the Central Silviculturist in commenting on or suggesting alterations in proposed working plans.

37. Co-operation with the Provinces.—The importance of securing co-operation between the Provinces and the Central Institute in the work of research is especially great in this Branch, and we have given careful consideration to the various means by which we think that such co-operation could be promoted. We think it desirable that Provincial Silviculturists and Working Plans Conservators should visit Dehra Dun at least once in every two years, and that other provincial officers, even if they are not definitely engaged in research work, should be encouraged to visit the Institute in order to gain some idea of the scope of the work done at Dehra Dun. There can be no compulsion about these visits ; but we believe that if the Provincial Forest Departments realised the benefits that would accrue from them they would give more opportunity to the officers under their control to come to Dehra Dun and study for a while certain aspects of forest work with which they might never otherwise become acquainted.

We also consider it desirable that before any officer takes up the post of Provincial Silviculturist he should spend a month or two at Dehra Dun in collaboration with the Central Silviculturist. It is not our suggestion that he should be trained by the Central Silviculturist, but that he should be given an opportunity of familiarising himself both with the methods of carrying out research work and with the methods of recording the results of that work. This short period at Dehra Dun might later prove of inestimable value to a Provincial Silviculturist in ensuring that his experiments were carried out in such a way as to be capable of comparison with work done in other provinces ; and we trust that Provincial Forest Departments will not allow minor considerations of convenience or the small expense involved to prevent the utmost use being made of the central organisation which exists for their benefit and their benefit alone.

38. The post of Central Silviculturist.—If the Central Silviculturist is to discharge effectively the responsibilities entailed by his position of authority as it has been outlined by us, he must be a man of exceptional qualifications. He must be a man not only of experience and seniority, but also of tact, or his advice will go unheeded ; he must be a man with the

original mind required for research, or his advice will be valueless ; he must, above all, be a man with an intimate knowledge of forest conditions, well acquainted with the nature of the difficulties which forest officers have to overcome, or his advice will be unpractical and useless. Such a man is difficult to find, and the post of Central Silviculturist should be sufficiently attractive to secure the best men available. We do not recommend that the post should automatically carry with it the rank of Conservator, as this might add to the difficulties of selection in particular cases. But we recommend strongly that occupation of the post should be given full weight when Provincial Conservators are to be appointed and should not be allowed to interfere in any way with its incumbent's chances of promotion. Facilities greater than are at present afforded should be given to the Central Silviculturist to study methods of silviculture on the Continent and in America ; and he should have every opportunity of touring the Provinces as frequently as possible.

39. The post of Assistant Silviculturist.—The post of Assistant Silviculturist is, in our opinion, a necessity. We suggest that, as far as possible an officer should be selected for this post who would be capable of becoming eventually a Provincial Silviculturist. After serving for five years as Assistant Silviculturist he would return to his Province to the ordinary forest work, and after a few more years of service there his claims to the post of Provincial Silviculturist when it fell vacant would merit the strongest consideration. Eventually such an officer might return to Dehra Dun as Central Silviculturist, for we anticipate that, in filling that post, prior consideration would be given to the claims of those officers who had held the post of Provincial Silviculturist.

Botanical Branch.

40. General.—This Branch, though an indispensable part of the Institute, is more self-contained than other Branches and its well-being is not dependent on the establishment and maintenance of a close connection with them.

With reference to the constitution of this Branch, we may observe that we see no reason why the post of Systematic Botanist should automatically carry with it the headship of the Branch. The present structure of Branches and Sections must not be considered immutable and the existing subordination of the Mycologist to the Systematic Botanist must not be held to imply the inherent inferiority of a Mycologist to a Systematic Botanist. The system now in force is one which has worked satisfactorily ; it was presumably adopted to suit the needs of the moment and we see no reason why, in the future, it should not be changed to suit the needs of the moment. When the present head of the Branch retires it might be desirable to regard Systematic Botany and Mycology as parallel Sections immediately under the Director of Research. We do not suggest that this should necessarily be done ; but we desire to point out that the present system should not be regarded as constituted by some irrevocable decree, but should rather be considered as a flexible, impermanent one capable of adaptation to suit the demands of expediency. We consider recruitment from the Forest Service desirable in this Branch if a suitable officer is available.

Entomological Branch.

41. General.—The Entomological Branch, like the Botanical Branch, works in comparative independence of other Branches. Its work is, however, of great importance to Forest Departments, especially in connection

with the control of insect pests. The dissemination of information which it acquires from outside sources as well as from consideration of results obtained locally constitutes an important part of its activities. We have no particular recommendations to make in regard to the work of this Branch, but we consider it advisable in the interests of forestry that officers in this Branch should, whenever possible, be recruited from the Forest Service. The observations which we have made with respect to the relations between the Systematic Botanist and the Mycologist apply *mutatis mutandis* to this Branch also.

Chemistry Branch.

42. Reconstitution as a Central Branch.—The Chemistry Branch undertakes a large amount of work for all Branches and Sections in the Institute and, in our opinion, its importance is great enough to justify its retention as a separate Branch working immediately under the Director of Research and the President of the Institute. In the past, there have been occasions when, to cope with the large amount of chemical work which has had to be undertaken in particular Sections, special recruitment of an Assistant with an adequate knowledge of chemistry has been made. Such occasions will recur in the future, but we think it undesirable, from an economic point of view, that this system of special recruitment should continue. We consider that the Chemistry Branch should be so adequately staffed that, whenever a Section requires a chemist either for whole-time or part-time work, a man could readily be supplied from the staff of that Branch who would return to it when his services were no longer required.

43. Expansion of the Staff.—The constitution of a Central Chemical Branch whose functions would be not only to perform the work of analysis and to carry out the experiments required by heads of Branches or Sections, but also to depute men to work in these Branches or Sections when needed, would undoubtedly be an economy. Already the staff of the Chemical Branch has more work than it can cope with, and it would thus be impossible, at the present time, to depute men to work in other Branches, as we have suggested. We consider that the staff should be strengthened either by transfer or recruitment. We have pointed out in para. 29 that direct recruitment of Upper Grade Assistants should only be resorted to as an exceptional measure and in connection with the activities of this Branch also we wish to emphasise the necessity of such careful selection as will ensure the appointment as Assistants of only highly qualified and reliable men.

ECONOMIC DEPARTMENT.

Minor Forest Products Section.

44. Activities of the Section.—The Royal Commission on Agriculture called attention to the importance to the agriculturist of the development of forest industries by the various Forest Departments and of investigation into the commercial possibilities of minor forest products.* But the field of exploitation lying open to this Section is so large that the activities of the staff should be most carefully directed if they are not to be dissipated. In the case of the majority of the minor forest products the methods of collection, sorting, preparation and marketing are unsatisfactory, and the need for improvement is manifest. In this matter the Section can help; but its activities must be

*Para. 224, Report of the Royal Commission on Agriculture in India, 1928.

carried on in the closest co-operation with the provinces. The Royal Commission on Agriculture have given their opinion that "In exploiting forest produce of all kinds it is very desirable that Forest Department should work in close touch with those responsible for the development of rural industries".* Only through co-operation between the Central Institute and Utilisation Officers and Directors of Industries in the provinces, and between Provincial Utilisation Officers and local industries, can effect be given to the improved methods which it is the task of the research worker to devise. It is desirable that both the head of the Section and his Assistant should be forest officers. We suggest that the Assistant should normally be recruited from the Provincial Forest Service as such an officer would be specially qualified to trace out the complicated course which forest products take between their collection in the forest and their appearance in a transformed state upon the market.

Wood Technology Section.

45. Connection with other Sections.—This section is at present working under the part-time direction of the Officer-in-Charge of the Timber Testing Section. A young Indian Officer is being trained in America and will take charge of the Section on his return. Though this is the youngest Section in the Economic Department it is one of the most important. The functions of the Wood Technologist are described in the Report of the Imperial Economic Committee on Timber in the following terms:—

"The first step in the determination of the probable uses of a timber is the microscopic examination of its cellular structure by a trained wood technologist. This examination not only enables a correct identification of species, but may disclose such a structure and properties as to render improbable any important industrial use. Thus, expense and effort in endeavouring to market a new timber for which the market prospects are small may be avoided. On the other hand, such examination may reveal a similarity of structure to a timber of proved commercial value and thereby afford a preliminary indication of profitable uses." What we wish to emphasise, however, is not so much the importance of this Section as its connection with other Sections. Timber Testing, Seasoning, Wood Preservation and Wood Working must all take into account the structure and composition of wood elements, and a knowledge of its individual characteristics is an indispensable preliminary to research work on any species of wood. We consider this Section, then, as one to which Assistants from other Sections might with profit be attached from time to time so that they could learn the work in greater detail than would be possible from casual visits. Such knowledge as they obtained would be of value to them subsequently in whatever work they were engaged, and it is on Assistants conversant with the work of several Sections that the Institute will rely in the future for the investigation of fresh problems as they arise.

Paper Pulp Section.

46. Activities of the Section.—In view of the fact that India has large supplies of bamboo and grass, work has been carried out by the Institute for a number of years on the conversion of bamboo into paper pulp. These experiments have now reached some degree of finality and it is

*Para. 224, Report of the Royal Commission on Agriculture in India, 1928.

†Para. 77, Report of the Imperial Economic Committee on Timber, 1928.

claimed that the process may be regarded as a commercial proposition. We are not in a position to estimate the prospects of further progress in this matter, but there is considerable field for investigation into the uses of savannah and similar grasses, and since the Institute has a trained man available as well as the necessary plant, the investigation can be undertaken without any great capital expenditure. The increasing cost of timber used for the purpose of paper-making has also led western countries to devote constant attention to the problem of making pulp manufacture cheaper, and we are of opinion that work should continue on these lines for the present. We think that the whole question should be reviewed in a few years' time with the object of determining whether the Section should continue or whether the money and effort involved could not be devoted to some more profitable object.

47. Upper Grade Assistant.—At present the Assistant is only on a temporary engagement. His main duty is to do the chemical work for the Section. We have recommended that all the chemical activities of the Institute should remain under the supervision of the head of the Chemical Branch* and we suggest that the present Assistant be transferred on probation to the Chemical Branch. If the head of the Chemical Branch considers him suitable for permanent appointment, he should be confirmed in a suitable grade and either he or some other person with the necessary qualifications would be deputed for chemical work in the Paper Pulp Section.

If it is found necessary to appoint an Upper Grade Assistant to the Paper Pulp Section it is hoped that the person selected would be capable of doing, in addition to his other duties, the comparatively simple chemical work of that Section. There would then be no necessity to delegate an Assistant from the Chemical Branch exclusively for the purpose.

Seasoning Section.

48. Expansion of Section.—In view of the fact that some form of seasoning is necessary for many types of timber and the results of experiments are capable of immediate application in practice, we would recommend sympathetic consideration of well thought out schemes of expansion and acceleration for the work of this important Section. It may be remarked that artificial seasoning is especially necessary for the refractory timber which grows in India. The Section has already given its advice and help in the erection of kilns at Lillooah on the East Indian Railway and at the Gun Carriage Factory at Jubbulpore, and it is hoped that, as a result of its investigations, many more hardwoods will be brought on the market which will, when kiln seasoned, be able to take the place of teak. Though the investigations of this Section should deal mainly with methods of kiln seasoning, air seasoning cannot be neglected. The varied climatic conditions of India do not allow the results obtained at Dehra Dun to be taken as a basis for calculations in other places; and any research into the reactions of timber to air seasoning which is of prove of value must be undertaken in conjunction with the Provinces. It is part of the work of this Section to give advice in the erection of kilns; and we would echo here the opinion given elsewhere in our report (para. 61) that it is not and should not be the task of the Institute to make estimates of commercial costs which are more properly the concern of industrial enterprises. The

work of this Section may give results of immediate practical utility and should be encouraged ; and steps should be taken as soon as possible to make provision for additional staff in the way we have recommended.

Timber Testing Section.

49. Desirability of avoiding disproportionate expansion.—In the number of its staff and the amount of its expenditure this Section has progressed beyond the stage yet reached by other Sections doing research work. Credit is, indeed, due to the Officer-in-Charge whose ability and enthusiasm have advanced the status and developed the activities of his Section to such an extent ; but we feel that it would be more desirable if Sections advanced *pari passu* and more regard were paid to their relative and proportionate development. We realise that an enormous field of investigation still lies before this Section unexplored, but there are problems no less important awaiting the investigation of other Sections, and we would advocate a more even degree of expansion by Sections doing work of equal importance. We recommend, therefore, that until other Sections have developed to a similar extent, proposals for engaging fresh staff in this Section should be entertained most cautiously. It might even be possible, on occasions, to transfer selected men from this Section to other Sections.

Wood Preservation Section.

50. Co-operation with Railways and Expansion of Section.—We have noted with regret that this Section has been without an Officer-in-Charge for over 18 months at a time when it might have provided particularly valuable service. The Railways are devoting considerable attention to the comparative merits of steel and wooden sleepers, and if a suitable treatment can be devised which will establish the supremacy of wooden sleepers the gain to the Forest Departments would be immense. One of the main lines of investigation by this Section has been to reduce wastage of timber by demonstrating that sapwood can be treated in such a way as to give it the durability of heartwood and to reduce the expense of treating sleepers with creosote, so that they may be used at a cost which compares favourably with that of steel sleepers. The introduction of half-round sleepers is also a matter which has engaged the attention of this Section. The necessity for continual skilled investigation into these matters is great and we may also call attention to the necessity of maintaining intimate touch with the Railways whose interests should be studied no less closely than those of the Forest Departments. In many cases the interests of the two are identical, and it is in such cases that the investigations of the Institute must prove of exceptional economic value. We consider that the importance of this Section requires that suitable additions to the staff should be made at an early date.

Wood Workshop Section.

51. Scope of its Activities in the Past.—The work of this Section falls naturally into three divisions, and these may be separately considered :—

- (i) *The Saw Mill.*—It is the main task of this part of the Section to convert logs into material required by other Sections for experimental purposes, of the size and shape specified by them. It is also claimed that advice is given to saw mills and that artisans are trained in Saw-doctoring, but we are doubtful whether the resources of the Institute ought to be, or can be, profitably employed on this task.

- (ii) *The Wood Workshop*.—A large amount of time is devoted to the production of specimens for the Timber Testing Section. Investigation into the working qualities and possible uses of Indian woods for furniture making is also carried on.
- (iii) *Veneers*.—This is a branch of the Section's activities which in the past has been somewhat neglected owing to the pre-occupation of the Officer-in-charge with other work. For several years attention was given almost exclusively to the task of panelling the New Delhi Secretariat and Legislative buildings.

52. Scope of its Activities in the Future.—We have examined the work of the Wood Workshops Section with considerable care and we do not think that its proper functions are of such a nature as to justify the retention by it of its present status as a Section. The main task of this Section is to prepare wood for experimental use by other Sections. In performing this task it undertakes a service of utility only and no such elaborate or technical processes are involved as would necessitate supervision by a highly paid expert. Nor can we see how the services of such an expert are essential to the proper investigation of the workability of Indian woods or their suitability for specific purposes.

It is claimed that new Indian woods whose suitability for manufacture into furniture has been established at the Institute can only be introduced into the market and popularised when samples of furniture made of these particular woods are available ; and that it is desirable that such furniture should be so exquisitely finished that it will attract the attention and compel the admiration of all who see it. We cannot admit that the obligations of the Institute to the public extend as far as this. It is reasonable that the possible uses of Indian timber should be investigated at the Institute, and it is desirable that the results of those investigations should be advertised in such a way as to secure a market for the wood in question. But we cannot agree that it is proper for a Research Institute to expend a disproportionate amount of the funds at its disposal not so much on the work of research itself as in making articles to illustrate the results obtained. We advocate a marked diminution in the cabinet making activities of this Section and suggest that the Wood Workshops should become a utility service whose function would be to supply the internal needs of the whole Institute. They should be under the control of a head mistri with sufficient technical skill to direct the staff and sufficient education to understand the full import of written orders. The fact that the charge of the workshops will fall vacant in a few years' time should be borne in mind, and the mistri who is ultimately to take full charge might well be found among the staff of the Institute.

53. Investigation into Methods of Veneering.—In recommending the reorganisation of this Section on a new basis we have not overlooked the fact that there are at present attached to it two European specialists on contracts of 7 and 5 years respectively, with technical knowledge and experience which render them capable of doing work of far greater skill and importance than would be required of the mistri in charge of workshops reorganised as we propose. The first of these, Mr. W. Nagle, has already carried on some investigation into the suitability of various Indian woods for purposes of veneering and into the properties of the different glues utilised in the manufacture of ply wood. The importance of such

investigations was emphasised in the Report on the Ply wood and Tea Chest Industry made by the Tariff Board in 1927. The Tariff Board said :—

“ Ply wood manufacture on a commercial scale being an industry of comparatively recent growth, there is still much scope for scientific investigation both into the processes followed and the suitability of the raw material used. In India in particular where climatic conditions are so different from those existing in Europe and America, considerable research is necessary before methods of manufacture which have been proved suitable elsewhere can be accepted as giving the best results in this country. Investigation is required into such matters as the best temperature and period for soaking logs, the proper moisture content of veneers at the time of gluing, the best combinations of different species of timber and the suitability of various kinds of timber for the manufacture of ornamental ply wood, to mention but a few of the pressing problems which are now engaging the attention of the authorities at the Forest Research Institute. We wish, therefore, to emphasise the great importance to the future of the industry of careful and reliable investigations being undertaken at the Institute at Dehra Dun ”.*

We ourselves are of opinion that this work is of far greater importance than the manufacture, for purposes of advertisement, of high class furniture and we recommend that Mr. Nagle's time be devoted to investigating the problems mentioned above.

54. Investigation into the Suitability of Indian Woods for Match Manufacture.—The second of the men to whom we referred above is Mr. Gray ; we suggest that when the Wood Workshops are re-organised his services might be employed in connection with the projected scheme of investigation into the manufacture of matches from Indian wood, whilst in the interval he might be employed on veneering work. It is clear that such research is necessary. The Indian Tariff Board recommended that a definite research project into the Match Industry should be drawn up at Dehra Dun Institute and elaborated their recommendation in the following terms :—

“ The problems to be investigated will include the suitability of the various kinds of Indian timber for match manufacture, the best method of storage, the extent to which the quality of the wood can be improved by previous treatment such as steaming or boiling and the prevention of attack by insects. We mention these merely as an indication of the extent to which investigation is needed in this industry and the list is by no means exhaustive.”†

*Chapter VI, paragraph 77, Report of the Indian Tariff Board regarding the grant of protection to the Ply wood and Tea Chest Industry, 1927.

†Paragraph 25, Memorandum on the Supply of Indian Wood for Match Manufacture. Annexure to the Report of the Indian Tariff Board regarding the Grant of Protection to the Match Industry, 1928.

We fully agree that an investigation into the suitability of Indian woods for the manufacture of matches is one which should and must be undertaken by the Institute. But before any project is initiated it is essential in the interests of economy that the limits and scope of the proposed investigation should be most carefully defined. The first question which suggests itself is "What is the criterion of suitability? How can it be determined whether a certain wood is or is not suitable for the manufacture of matches?" Experience in the past has shown that certain woods split and peel well and appear to be eminently suitable for use as match splints. But they fail when subjected to the later processes of dipping, polishing, packing, etc. It might be imagined at first sight that if the recommendations of the Institute with respect to match wood were to have any value, the Institute itself must instal a match manufactory, that it must put match splints through all the processes precedent to their appearance packed in boxes in marketable form; and that if it is to estimate the cost of production, it must carry out the manufacturing process on a commercial scale. The expenditure involved in such an undertaking would be enormous, and it would be unreasonable in our opinion for the Institute to devote so disproportionate a part of its income to research on one particular project. There is, however, an alternative. Any investigations carried on by the Institute into the manufacture of matches from Indian woods are of immediate interest to match manufacturers, and would, if successful, be of direct advantage to them. We suggest that before any project is drawn up or any elaborate manufacturing plant installed, the Forest Economist should convene a meeting of representatives of the match trade, and consult them as to their exact requirements. We suggest as a possible arrangement that the Institute should test the *prima facie* suitability as match splints of all those woods which are available in any considerable quantity and are also easily accessible, and should then send samples of the splints to match manufacturers in India who would report to the Institute on the way in which the splints had stood the final processes. Information would then be available for determining what Indian woods were most suitable for conversion into matches and whether the cost of extraction, treatment, etc., was such as to make their exploitation commercially profitable. We are inclined to indicate this as a possible line of attack and make the further suggestion that Mr. Gray's abilities might suitably be devoted to the preliminary investigations.

55. Personnel.—The proposal to train a young Indian Assistant to take Mr. Nagle's place as an expert cabinet maker will, if our recommendations for the future of the Wood Workshops are accepted, be superfluous. If, contrary to expectations, research into the manufacture of ply wood is not finished by the time Mr. Nagle's contract expires it should be possible to entrust the conduct of further investigations to an Assistant trained in accordance with our general scheme.

CHAPTER VIII.

GENERAL WORKING OF THE INSTITUTE.

56. Internal co-ordination and co-operation.—We have discussed the problems with which individual Branches and Sections in the Institute are faced, but there are a number of considerations which affect them all. Chief amongst these is the necessity for encouraging amongst members of the Institute knowledge of each others' work and sympathy with its aims. We are in complete accordance with the views of the Royal Commission on Agriculture in India on this matter. They say "The co-ordination of the research work carried on in the various sections of a research institute is only a degree less important than that of co-ordinating the work of the institution as a whole with that of other research institutions. Work is apt to get into a groove. Barriers are apt to rise, especially when research institutions are located in remote places where the intellectual stimulus provided by intercourse with intelligent outside opinion, not necessarily of a scientific character, is absent*." The Report goes on to describe the system in force at Rothamsted :—

"The whole of the staff together with any post-graduate and other workers at the Institute assembles twice a month, except in the holiday season, to hear from some one person an account of the work he has done and to discuss it. All the work of the station is thus brought under review before it is published. The laboratory assistants are also invited to attend when the subject interests them. The entire body of workers also meets daily ; there are no formalities, but every worker has the opportunity of meeting the others. All the junior members of the staff are expected to have a general acquaintance with the work of every department of the Institute, to be able to show scientific visitors round and to explain, in broad outlines, the investigations in progress. To facilitate acquisition of this knowledge, statements are drawn up periodically by the heads of the various departments and circulated among the staff ; staff tours of the laboratories and fields are also arranged when suitable demonstrations are given. It is held that the result of these activities is that the work of the various departments tends to grow into one whole ; much joint work is arranged and there is considerable discussion and interchange of views". We do not make the definite recommendation that this system should be adopted *in toto* at Dehra Dun. It is a system which cannot usefully be forced on a scientific body by higher authorities, as it depends for its success so largely on its informality and the enthusiasm with which it is operated by members of the staff. We do believe, however, that a periodical colloquium of the type suggested would do much to break down the barriers which are already growing up between the different Sections and Branches in the Institute ; it would promote, too, an atmosphere of friendliness in which discussion could be carried on without resentment or bitterness. We commend this system to the authorities at the Institute as being worthy of at any rate a trial.

57. Temporary appointments to be avoided.—No less important than the establishment of a friendly atmosphere throughout the Institute is the possession, by the research worker himself, of a tranquil mind. We are aware that this is largely a personal matter which cannot be regulated

*Para. 64, Report of the Royal Commission on Agriculture in India, 1928.

by any external agency. At the same time something can be done to prevent anxiety about their future from worrying and distracting members of the staff of the Institute. Temporary appointments and short term agreements give a feeling of impermanence and insecurity which is bound to affect a man's work. It is particularly important that a man doing research should see his future clear before him and be able to plan out his work ahead without having to make the term of his project coincide with the term of his contract. We consider that the appointment of members of the staff on short term agreements should be avoided as far as possible. A term of probation followed by permanent appointment is the most satisfactory method of engaging members of the staff and we hope that it will be followed in the future whenever possible.

58. Continuity of work.—We had occasion to observe* that the work of the Wood Preservation Section had suffered from having no officer in charge for a period of over eighteen months. Any work must suffer when the person most qualified to do it is away ; but we think that steps should be taken to prosecute investigations as vigorously as possible even in the absence of the special officer in charge of a Section. We hope that the system of generalised training of Assistants which we have advocated, and their interchange between different Sections, will make this easier. There should be at least as many officers in the Economic Department in the grade corresponding to that of what are now known as Upper Grade Assistants as there are Sections in that Department, and if the services of these Assistants are utilised in different Sections as opportunities arise, there will be a broad field of selection whenever a vacancy occurs. No officer should go on leave without satisfying himself that the work committed to his charge will be carried on in his absence as satisfactorily as circumstances permit. If such provision is not made, expensive plant will lie idle and the progress of investigations of practical urgency will be delayed.

59. The keeping of Records.—If the work done by different Sections is to be continuous and is to remain comparatively unaffected by changes in the personnel of these Sections, it is essential that the records of that work should also be continuous. The keeping of records is a dull and exacting task, but it is, none the less, essential. Results which appear unimportant at the time they are obtained may prove of the greatest value in later years ; and if a research worker conscientiously records all negative results obtained by him he may save a successor many hours of labour. Such records must be kept in an easily intelligible form. It is not enough that their author can understand them. They should be in such a form that outside inquirers can make use of them, and they should be readily intelligible to any officer who eventually succeeds to the charge of the work. There must be no mysteries and no secrets in the work of the Institute. Its results must be available for the use of all without prejudice or favour ; and this can only be achieved by filing all information and recording all results with clarity, accuracy and despatch. Special precautions should, we consider, be taken to preserve all records from fire and other potentially destructive agencies and there must be no risk of losing for ever information which it has been the task of many years to compile.

60. New Sections.—There is one difficulty which, we anticipate, will constantly recur, particularly in connection with the activities of the Minor Forest Products Section. From time to time problems will arise which

*Para. 50.

will demand for their solution specialised research and, perhaps, the erection of elaborate plant. The question must then be faced whether, under these circumstances, separate *ad hoc* sections should be formed. In general we are opposed to the multiplication of Sections. Each case will, of course, be judged on its merits and the definite recommendation of the Advisory Board, if constituted, would, we assume, be a necessary preliminary to the inauguration of a new Section. But it is our own opinion that new Sections should only be opened after the most careful consideration of possible alternatives. We anticipate that members of the staff, with the general scientific training which it is the object of our proposed scheme of recruitment and interchange between sections to secure, will themselves be capable of undertaking new projects. We see no reason why, in the majority of cases, new Sections need be opened or the services of experts recruited from outside. In special cases time and labour may be saved by recruiting expert assistance for a short period ; but we are of opinion that the staff of the Institute should be selected and trained in such a way that they are capable of tackling such problems as arise, and the necessity for engaging experts should become increasingly rare.

61. Limitations to the scope of the Institute's activities.—One difficulty with which the Institute is faced is that of determining how far it is justified in subjecting results obtained in the laboratory to further tests and experiments on a quasi-commercial scale. In a great many cases such testing would involve the erection of elaborate machinery which it is beyond the resources of the Institute to provide, and where such testing has not been undertaken we think that the Institute should exercise considerable caution in making estimates of commercial costs. To confine the Institute's activities to those matters which come properly within its cognisance as a body of research workers is not to limit unduly the sphere of those activities but to ensure that their value is not obscured by the introduction of such things as commercial factors (*e.g.*, overhead charges) which vary from place to place. The Institute cannot be expected to give an accurate estimate of commercial costs, though in many cases what is believed to be a typical example may prove of use. The responsibility of the Institute should not extend beyond the computation of the actual costs of production or treatment as manifested in their own experiments. Any calculations of the costs of working on a commercial scale can only be provisional and we think that the Institute should only publish these with great caution. We realise that the potential costs of a commercial undertaking must always be borne in mind in considering the possible utility of any work of research, but we do not think that it is the function of the Institute to make detailed calculations of those costs.

62. Contributions by Industrial concerns.—There is no doubt that, if a correct estimate of production on a commercial scale can be made, industrial concerns will benefit. We have considered whether, where the resources of the Institute are inadequate to enable manufacturing processes to be undertaken on a large scale, or where the investigation of some new and pressing problem demands a greater capital outlay than the Institute can afford, the co-operation of industrial concerns which are directly interested in those investigations and would benefit from their successful issue, might not be invited*. Thus, they might effectively help by contributing to the cost of the investigations or by supplying, at their own

**Cf.* para. 54 on the subject of the co-operation of match manufacturers.

expense, experts to initiate inquiries and provide the technical skill required in their preliminary stages. The difficulty of proceeding in this way is that Government can scarcely pay a part of the costs of an investigation whose results are to be kept private, whilst few firms would be prepared to contribute to the expense of experiments whose results were to be broadcast to their competitors. The difficulty, indeed, appears to be almost insuperable, but the suggestion might well be borne in mind for, as a result of such co-operation, the maximum use would be made of any results obtained. People are apt to minimise the importance of information given gratis ; but they will do their utmost to extract its full value from the result of any investigations to whose cost they have themselves contributed.

63. Visits to the Research Institute by Forest officers.—We have given our opinion* that the maintenance by the Institute of close touch with forest officers is no less important than contact with the business world. We believe that the most effective method of establishing this touch is for forest officers themselves to visit Dehra Dun and see the activities that are in progress there. The staff of the Institute would benefit from such visits, for their attention would be attracted to difficulties or possibilities perhaps unrealised before, which had presented themselves to officers in the course of their daily life in the forest. But the advantage to provincial officers themselves would be yet greater. They would realise the broad scope of the work of the Institute. They would realise that the Provinces could not fail to derive benefit from it ; and they would realise that members of the staff of the Institute were in a position to give not only information but also helpful advice on most subjects connected with forestry. We have suggested, in connection with the co-operation of the Central Silviculturist with the Provinces†, that even those Provincial forest officers who are not definitely engaged on research work should be encouraged to visit Dehra Dun as much as possible ; we know that they will be welcomed there ; and we trust that Provincial Forest Departments will realise the advantages of encouraging them to go.

64. The Buildings.—The buildings of the new Institute are very large, and the staff will not occupy them fully for many years to come. If it is decided that the Indian Forest Service College should leave its present situation at Chand Bagh, it could be suitably located in the Institute, where museums and other objects of interest would be available for instructional purposes.

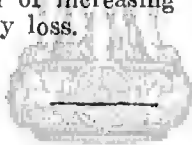
65. Patents.—We are of opinion that whenever a process is invented or perfected at the Institute the desirability of protecting it by a patent should be considered. This patent should be the property of the Government of India and if it has to be taken out in the name of the original inventor, regulations should be made requiring him to transfer it to Government. It would be for the department to consider in which cases a royalty should be charged for the use of this patent and it would also be within their power to make an *ex gratia* payment to the original inventor.

66. Study leave.—It has been represented to us that the facilities given to officers at the Institute for studying abroad are inadequate. We consider it desirable that every encouragement should be given to research workers to familiarise themselves, by personal inspection, with the work, similar to their own, which is being done abroad. We are not prepared

*Para. 16.

†Para. 37.

to make a definite recommendation for the introduction of the "Sabbatical Year" system which is very generally employed at research institutions in other countries and allows research workers to travel abroad for purposes of study once in every seven years. Study abroad is not equally necessary for all research workers at the Institute. But the value of a research officer is undoubtedly increased if he can see in actual practice methods or systems of which he has only heard, if at all, through books. Under the present rules for study leave, it is only in exceptional cases that an officer of the Forest Department does not have to pay his own travelling expenses and the fees for any course of study which he takes. Special arrangements have been made by which selected forest officers can tour on the Continent to "keep their professional knowledge up-to-date", and are allowed their travelling expenses from and back to London; they are also given a daily allowance: But these arrangements are only applicable to officers on leave in England, and will need readjustment in the future if they are to be of use to men whose leave is not normally taken in England. The terms on which deputation is allowed are more favourable, but no officer can go on deputation without the sanction of the Secretary of State, and it would be unreasonable to refer to so high an authority applications which should not, we think, be considered in any way abnormal or exceptional. We have not thought it our duty to suggest the actual means whereby greater facilities for study leave or deputation may be given; but we wish to record our opinion that the need of outside study for research workers is a special one, and that opportunities should be given to them of increasing their value without involving them personally in pecuniary loss.



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CHAPTER IX.

EXTERNAL RELATIONS OF THE INSTITUTE.

I.—*Co-ordination of Research Work.*

67. Difficulty of sharing programmes of work.—Co-ordination of research work throughout the world is an impracticable ideal ; but it is desirable that scientists and research workers should be acquainted as intimately as possible with investigations proceeding in other parts of the world which are similar to those on which they are themselves engaged. If they are not intimately acquainted with the development of such external investigations, they are liable to waste their energies in attempting to discover a solution to problems which have been already solved or in working on hypotheses which have already proved erroneous. All research work involves the application of general principles to particular material ; knowledge of those general principles is a necessity for every research worker ; but the distinguishing feature of the work at the Institute at Dehra Dun is that the material treated is, in the majority of cases, of a peculiar nature. We refer particularly to the work of the Economic Department where the material treated is peculiar to the forests of India. The Indian forests contain timber and other products which are unknown in foreign countries ; their properties must be discovered, their composition must be analysed and their economic value must be determined. The task of the Institute is, therefore, a special one and we do not consider it possible for its programme of work to be very closely co-ordinated with that of other similar institutions abroad. In the Entomological and Botanical Branches such co-ordination is easier and the Systematic Entomologist at Dehra Dun has taken as his share of an international project the identification of certain groups of beetles and the description of the larval stages of forest insects. We understand that it is intended to locate the new Institute of Medical Research at Dehra Dun ; and we hope that the Minor Forest Products Section of the Forest Research Institute will be able to co-operate with the Medical Research Institute in determining the value, both medicinal and economic, of those drugs and herbs which grow in such profusion in the Indian forests and whose properties are as yet largely unknown. We do not suppose that any programme of work could profitably be shared by the Minor Forest Products Section of the Forest Research Institute and that Section of the Medical Research Institute which deals with the medicinal herbs and drugs, but we do believe that many questions which either Section would be inadequate to dispose of by itself will be quickly answered when expert knowledge from two aspects is brought to bear upon them.

68. Methods of promoting co-ordination.—We have stated* that the forest products whose qualities are investigated at Dehra Dun are, in the majority of cases, of a nature peculiar to India. But though the subject of investigation is different it is not an implication of our statement that the methods of investigation should also be different. They are, and must continue to be, in many cases identical with those adopted

*Para. 67.

at similar institutions abroad. It is our task to consider means whereby the research worker at Dehra Dun may be in the closest touch with similar workers abroad. There are several methods of achieving the desired end. The first and most beneficial method is to send workers at the Institute abroad for training either on deputation or by mutual interchange with the staff of other similar Institutes or laboratories. These suggestions are dealt with in paras. 66 and 34 of our report. Another method is to send representatives to attend the major forestry conferences which take place at frequent intervals. Only officers who may be able to make some definite contribution to the discussions which take place should be sent to these Conferences. We understand that representatives have been sent from the Institute in the past and we recommend the continuation of the practice. Yet another method is to ensure that all publications of the Institute are distributed as widely as possible and conversely, that all publications of interest to workers in the Institute should be not only available to them, but brought to their individual notice. The establishment at the Institute of a colloquium (which we have discussed in para. 56) would undoubtedly be of advantage in this respect. "The value of additions to knowledge secured by research is conditioned by the extent to which information regarding them is disseminated among the workers concerned. If steps are taken to secure adequate publicity for scientific results both the time of the scientists and, in the case of research financed by the Government, public funds will be saved".* Publicity, then, should be given to the results of investigations held at the Institute as well in the interests of science as in the interests of trade. We have found research workers at Dehra Dun well aware of the nature of investigations proceeding in Canada, in the United States of America and at Princes Risborough in England; and we have no doubt that the interchange of publications will continue to have beneficial results.

II.—*Publicity and Utilisation.*

69. **Association with Railways.**—Means to promote more intimate and permanent contact between the Institute and the consumer have been discussed in connection with the duties of the Forest Economist and the distribution of publications in paras. 19 and 74. But we wish to draw particular attention to the desirability of the closest touch being maintained with the railway administrations. The Railways are by far the largest consumers of wood in India and it is possible that investigations now in progress at the Institute may result in a greatly increased consumption of indigenous timber by the Railways. It is essential that the Institute should know in detail the requirements of the Railways; and it is equally essential that the Railways should, on their side, be fully aware of the advantages which may accrue from their employment of the resources of the Institute. At present the Timber Advisory Officer to the Railway Board acts as a liaison officer between the Railways and the Forest Departments. We see no reason to suppose that the work of the Forest Economist in his capacity as Utilisation Officer will duplicate that of the Timber Advisory Officer to the Railway Board. On the contrary, the co-operation of these two officers should promote at once the interests of

*Para. 328, Report of the Research Co-ordination Sub-Committee (H. M. Treasury), 1928.

the Institute and the Railways. Investigation at the Institute into the suitability of various woods for use in coach building cannot be of anything but benefit to the Railways as well as the Forest Departments, and if the Institute can devise methods of extending the life of sleepers or reducing the cost of treatment, a double advantage will be again achieved. But the Institute must know in detail what is required of it; and the Railways must realise the limitations of work done at a research laboratory on a small scale.

70. Timber Adviser to the High Commissioner.—The Forest Economist will, it is hoped, keep the Institute in touch with requirements in India and help to introduce new woods on the Indian market. But England and America too are markets for Indian woods with great potentialities and it is essential that more effort should be made to keep the Institute informed not only about the developments in those markets but also about the requirements of the principal consumers of Indian wood in those countries. The task of maintaining this contact is at present entrusted to the Timber Adviser to the High Commissioner in London, who works in conjunction with the Trade Commissioner of the Government of India. We consider that this officer should be a man in close touch with recent developments and the progress of research in India itself. The post should, we consider, be held by someone who has recently been associated with the Institute, either the retiring Inspector General of Forests or the President of the Institute or some other man equally acquainted with its work and conversant with modern forest practices and possibilities. The post should not, we consider, be tenable for more than a maximum period of five years. The result of such an appointment would be the creation of a wider sphere of influence for the Institute and the continued utilisation of the services of men with an up-to-date knowledge of Indian forests and the possibilities of exploiting them.

III.—*Publications.*

71. Means to ensure accuracy of publications.—The present method of checking those literary contributions by members of the Institute which are intended for publication by the Government of India in the form of memoirs, records and bulletins is as follows :—

Branch Officers submit all such contributions to the President, who examines the papers and suggests any alterations which may appear desirable to him. He also decides what illustrations are necessary and arranges for the printing of illustrations and letter press. Contributions intended for publication by the Government of India must also be examined by two independent experts in accordance with the orders of Government issued on the recommendation of the Public Service Commission.

We do not think that the present arrangements need any substantial modification. We understand "two independent experts" to mean two authorities who have not been directly responsible for or connected with the inquiries on which a report is being made. If, "independent experts" meant "independent of the Institute", the delays in securing the publication of any report or bulletin would be so great as to render the report or bulletin itself already antiquated when it first

appeared in print. In India the only experts in certain branches of the work of timber utilisation are themselves on the staff of the Institute ; and if the examination by other experts in England and America of contributions by members of the Institute were made a necessary preliminary to publication, there would, we think, be no advantage such as would afford adequate compensation for the delay involved. In a subject like forestry there are no governing fundamental principles by which the results of particular investigations can be tested. Effective checking is therefore impossible. In estimating the scientific value of the Institute's publications the criterion which will probably appeal most strongly to those who find the money will be the practical results obtained from the data provided in those publications. We suggest, however, that a general view of the value or accuracy of proposed publications might be provided by a discussion of them at the meetings of the staff which we recommend in para. 56 of our Report. A colloquium of the nature suggested may bring to light deficiencies which might pass unnoticed by a revising authority acting independently, and would provoke free discussion and criticism.

72. Responsibility for publications.—We have pointed out that any effective checking by outside authorities is impossible. The only effective check which could be applied to the majority of the technical publications of the Institute would be to carry out the experiments again *in toto*. Such a course is impossible, and it is clear that ultimately responsibility for the accuracy of any publication must lie on the author and on the author alone. Permission to publish should be given by the President on the recommendation of a Branch Officer ; and though these officers are expected to satisfy themselves that contributions have been carefully and conscientiously compiled, they can in no way be brought to account for any inaccuracy which may subsequently be discovered.

73. Publication in Trade and Scientific Journals.—We are of opinion that the Institute should not rest content with the publication of its official bulletins as a wholly adequate method of bringing results of investigations to the notice either of scientific workers or the general public or the intermediary timber merchants. The Research Co-ordination Sub-Committee have emphasised in their report the necessity of publishing results in such a form as will ensure their maximum publicity and utility. They say—"If the best results are to be obtained from the Government contribution to the common stock, care must be taken to ensure not only that results are published but that they are published in such a manner as to be most readily available to scientific workers. One of the greatest difficulties with which workers are faced at the present time is the immense growth in recent decades of the number of scientific journals with which they have to deal. The question is one that will require to be tackled at an early date by the workers themselves in the various branches of science. In some directions efforts have been made to compile periodical bibliographies of current publications, but much remains to be done. This is probably not a matter in which Government effort is either possible or desirable. It is, however, incumbent on the Government to avoid adding to the mass of publication that must be searched by scientific workers if there already exist adequate means for the purpose in the scientific world. The great bulk of scienti-

fic papers has in the past been published in the Proceedings and Transactions of the various learned Societies and in the Technical Journals and the whole of it has been undertaken at the charge of individual workers banded together for the purpose. This process will no doubt continue, and no Government Department could hope to obtain for material published directly by itself the authority and freedom obtained for papers accepted by the leading Societies for publication in their Transactions. By this means results receive the most effective publicity by being brought directly to the notice of the workers concerned."

An interesting parallel is also afforded by a note on the work of the Forest Products Laboratory at Madison in the U. S. A. This note says "Formerly the investigations of the laboratory were all published in Government bulletins. This practice has given way to publications in trade and scientific journals until the more complete or exhaustive monographs are issued by the departments."

We therefore recommend that officers of the Institute should be encouraged in every possible way to publish scientific or semi-scientific papers in trade and other journals. It would serve a most useful purpose, if, for instance, notes were written periodically on subjects of interest to Railways and published in Railway Magazines such as the Quarterly Technical Bulletin which has a wide circulation amongst railway officials. Proposals to publish in outside periodicals and journals should be submitted in the first instance to the President of the Institute for approval.

74. Distribution of publications.—Copies of all reports and bulletins of the Institute should, we consider, be distributed free to all Chambers of Commerce, approved Associations and Directors of Industries throughout India. There are few people engaged in business on any considerable scale who do not belong to the particular Chamber or Association concerned with their interest and the free distribution of publications through those bodies should bring more effectively to the notice of those people the work of the Institute. Every opportunity should be taken by the Central Publication Branch of the Government of India to advertise the Institute's publications as widely as possible. The suggestion has also been made to us that it would be to the advantage of commercial interests, if, in the list of previous issues contained in official publications, a separate classification were made which would keep distinct those publications which are primarily of interest from the theoretical point of view from those which have a more practical bearing. We are of opinion that the adoption of this suggestion would prove of practical utility. Many of the publications of the Institute embody the results of research work and experiments of direct interest to the Railways and we suggest that these should be circulated free of cost to those branches of the Railways immediately concerned.

*Para. 328, Report of the Research Co-ordination Sub-Committee (H. M. Treasury), 1928.

†P. 37, Industrial Research in the U. S. A., by A. P. M. Fleming, M.I.E.E., 1927.

CHAPTER X.

CONCLUSION.

75. Table of Contents.—We have considered the advisability of embodying our conclusions in a summary. Our proposals, however, range from definite recommendations to tentative suggestions ; they are already entered under appropriate headings ; and in the circumstances we consider that the table of contents will serve the purposes of reference adequately.

76. Acknowledgments.—We wish to take this opportunity of placing on record our sense of appreciation for the very valuable assistance which the Secretary, Mr. E. B. Wakefield, I.C.S., has given us. He was asked to take up this duty at a day's notice and indeed arrived at Dehra Dun a couple of days after two members of the Committee had assembled. Were it not for his conspicuous ability and strenuous labours, we could not have completed our investigation and report in the short space of less than one month and a half.

The staff have also had a heavy task to perform and we would like to express our obligation to them.

(Sd.) C. L. MEHTA,

Chairman.

(Sd.) F. A. LINDEMANN,

Member.

(Sd.) F. H. WROUGHTON,

Member.

(Sd.) E. B. WAKEFIELD,

Secretary.

New Delhi, the 30th March 1929.

APPENDICES



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APPENDIX

Classified list of Officers at the Forest Research Institute

No.	Designation.	Name.	Date of Birth.	Date of appointment to present post.
1	2	3	4	5
				I.—DIREU
1	Inspector General of Forests and President of F. R. I. and College.	*Mr. A. Rodger, O.B.E.	11th Aug. 1875	1st April 1926 .
2	Vice-President and Professor of Forestry.	*Mr. C. G. Trevor . .	28th Dec. 1882	4th Oct. 1926 .
				II.—RESEARCH
				A.—SILVICULTURAL
3	Silviculturist . . .	*Mr. H. G. Champion, M.A.	17th Aug. 1891	2nd Jan. 1926 .
4	Assistant Silviculturist . .	Vacant . . .	..	..
5	Assistant, Upper Grade . .	Pandit Bhawani Dal Pant, B.Sc.	8th Feb. 1896 .	18th Oct. 1926
6	Assistant, Upper Grade . .	Lala Ishwar Das Mahendra, M.A.	15th June 1895	1st Feb. 1928
				B.—ECONOMIC
7	Forest Economist . . .	*Mr. H. Trotter . . .	16th Aug. 1890	1st May 1928 .
8	Assistant Forest Economist .	*Mr. B. H. Osmaston .	30th Mar. 1895.	14th May 1928
	MINOR FOREST PRODUCTS SECTION.			
9	Officer in charge . . .	*Mr. F. D. Ardagh, M.A. .	7th Dec. 1893	27th April 1926
10	Assistant, Upper Grade . .	S. Ramaswami, M.A. .	..	22nd March 1929
	WOOD TECHNOLOGICAL SECTION.			
11	Wood Technologist . . .	Mr. K. A. Chowdhury, B.A., B.Sc.	1st Feb. 1902	1st June 1927
	PAPER PULP SECTION.			
12	Officer in charge . . .	Mr. W. Raitt, F.C.S., M.I. Chem. E.	23rd March 1866	1st Dec. 1920
13	Assistant . . .	Mr. M. P. Bhargava, M.Sc.	19th Dec. 1897	1st Aug. 1923
14	Assistant, Upper Grade . .	Mr. Chatter Singh, B.Sc. .	9th Sep. 1898	3rd Aug. 1926
	SEASONING SECTION.			
15	Officer in charge . . .	Dr. S. N. Kapur, Ph.D., A.M.I.Chem.E.	20th Aug. 1895	23rd June 1928

* Indicates members of the Imperial Forest Service of

† Overseas pay drawn in sterling in England by members of the Imperial Forest Service

‡ Personal

and College corrected up to 1st April 1929.

No.	Head-quarters.	Emoluments.				Remarks.
		Substantive pay.	Over-seas pay.	Allowance.	Total.	
	6	7	8	9	10	11
TION.		Rs.	Rs.	Rs.	Rs.	
1	Dehra Dun :	3,250	..	..	3,250	
2	Do. :	2,150	-	350	2,500	Conservator of Forests, United Provinces.
STAFF.						
BRANCH.						
3	Dehra Dun :	1,000	-	S. P. 150	1,150	Deputy Conservator of Forests, United Provinces.
4	..	..	..	..	..
5	Dehra Dun :	450	..	S. P. 75	525	Extra Assistant Conservator, United Provinces.
6	Do. :	425	..	S. P. 75	500	Extra Assistant Conservator, Punjab.
BRANCH.						
7	Dehra Dun :	1,050	-	S. P. 250 + Rs. 100 Charge allowance.	1,400	Deputy Conservator of Forests, Burma, also charge holds of the Wood Preservation Section in addition, from 22nd April 1927, until further orders.
8	Do. :	900	+	S. P. 150	1,050	Deputy Conservator of Forests, United Provinces.
9	Dehra Dun :	950	+	S. P. 150	1,100	Deputy Conservator of Forests, Madras.
10	Do. :	250	..	S. P. 75	325	
11	Dehra Dun :	350	..	..	350	Under training. To be engaged on a 3 years contract on a pay of Rs. 350—50—550 after satisfactory conclusion of his studies in America.
12	Do. :	1,850	..	..	1,850	Term extended up to 31st October 1929; on leave.
13	Do. :	625	..	S. P. 150	775	Offg. Officer in charge.
14	Do. :	270	..	..	270	Appointment to be continued for a further period of one year, from 3rd August 1928 on Rs. 270 per mensem.
15	Do. :	525	..	S. P. 150	675	

India recruited in England, who are not of Asiatic domicile has not been shown in column 8. pay.

Classified list of Officers at the Forest Research Institute

No.	Designation.	Name.	Date of Birth.	Date of appointment to present post.
1	2	3	4	5
				II.—RESEARCH
				B.—ECONOMIC
	MEASURING SECTION—contd.			
16	Assistant, Upper Grade . . .	Vacant . . . . .	..	..
	TIMBER TESTING SECTION.			
17	Officer in charge	Mr. L. N. Seaman, M.A., B.Sc., M.E.I.C.	20th Aug. 1882.	11th Sep. 1920
18	Assistant	Mr. R. K. Banerjia, B.Sc., C.P.E.	30th Jan. 1899	10th Dec. 1926
19	Assistant, Upper Grade . . .	Mr. Syed Mohammad Hasnain.	31st March 1897	1st April 1924
	WOOD PRESERVATION SECTION.			
20	Officer in charge	Vacant . . . . .	..	..
21	Assistant	Mr. S. Kamesam, B. E., (Mech.), M.E. (Hons.), A.M.I.E.	12th April 1895	5th Sep. 1923
22	Assistant, Upper Grade . . .	Vacant . . . . .	..	..
	WOOD WORKSHOPS SECTION.			
23	Officer in charge	Mr. W. Nagle	12th June 1885	11th Feb. 1924
24	Cabinet Maker	Mr. W. Gray . . . . .	..	24th Sep. 1928
25	Mechanical Engineer	Mr. Ram Das Tandan .	23rd July 1887	1st Aug. 1923
26	Assistant Electrical Engineer .	Vacant . . . . .	..	..
				C.—BOTANICAL
27	Systematic Botanist	*Mr. R. N. Parker, F.C.H.	4th Dec. 1884	5th Sep. 1924
28	Oecologist	Vacant . . . . .	..	..
29	Mycologist	Dr. K. D. Bagchee, M.Sc., (Cal.), D.Sc. (Lond.), D.I.C.	19th Jan. 1898	1st Mar. 1927
30	Assistant, Upper Grade . . .	Mr. Basant Lal Gupta, M.Sc., F.L.S.	Dec. 1889	1st Mar. 1920
31	Assistant, Upper Grade . . .	Mr. Abdul Hafiz Khan .	July 1884 .	1st Mar. 1920
				D.—ENTOMOLOGICAL
32	Forest Entomologist	*Dr. C. F. C. Beeson, M.A., D.Sc., F.E.S.	10th Feb. 1889	7th Aug. 1913

* Indicates members of the Imperial Forest

† Overseas pay drawn in sterling in England by members of the Imperial Forest

and College corrected up to 1st April 1929—contd.

No.	Head-quarters.	Emoluments.				Remarks.
		Substantive pay.	Over-seas pay.	Allowance.	Total.	
	6	7	8	9	10	11
STAFF—contd.		Rs.	Rs.	Rs.	Rs.	
BRANCH—concl'd.						
16	..	..	..	..	..
17	Dehra Dun .	1,950	..	100 Charge al- lowance	2,050	Re-engaged for 5 years from November 1925. Holds charge of W. T. Section from 11th August 1927 in addition.
18	Do. .	575	..	..	575	Engaged temporarily for 5 years.
19	Do. .	350	..	S. P. 75	425	
20	..	..	..	..	..
21	Dehra Dun .	575	..	S. P. 50	725	
22	..	..	..	..	..
23	Dehra Dun	860	..	..	950	Term extended up to 10th February 1937, on leave.
24	..	..	..	..	800	500—50—700. Engaged for 5 years. Offg. as Officer in charge, W. W. Section.
25	Dehra Dun .	650	..	..	650	Re-engaged for 5 years from 1st August 1928. Pay Rs. 650—25—750.
26	..	..	..	..	..
BRANCH.						
27	Dehra Dun .	2,150	+	S. P. 150	2,300	Conservator of Forests (Substantive).
28	..	..	..	..	..
29	Dehra Dun .	700	..	..	700	For 3 years. (Pay Rs. 600—50—700).
30	Do. .	430	..	S. P. 75	505	
31	Do. .	430	..	S. P. 75	505	
BRANCH.						
32	Dehra Dun .	1,150	+	S. P. 150	1,300	Deputy Conservator of Forests, Punjab.

Service of India recruited in England.

Service who are not of Asiatic domicile has not been shown in column 8.

Classified list of Officers at the Forest Research Institute

No.	Designation.	Name.	Date of birth.	Date of appointment to present post.
1	2	3	4	5
	WOOD WORKSHOPS SECTION— <i>contd.</i>		II.—RESEARCH	
			D.—ENTOMOLOGICAL	
33	Divisional Forest Entomologist	Vacant . . . .	..	..
34	Ditto.	Vacant . . . .	..	..
35	Systematic Entomologist .	*Mr. J. C. M. Gardner, A.R. C.S., D.I.C., F.E.S.	15th March 1894	1st Aug. 1923
36	Assistant, Upper Grade . .	Mr. N. C. Chatterjee, B.Sc., F.E.S.	Dec. 1890 .	1st March 1920
37	Assistant, Upper Grade . .	Mr. R. N. Mathur, M.Sc. .	19th July 1903	30th Sep. 1927
			E.—CHEMICAL	
38	Bio. Chemist	Dr. Sri Krishna, PhD, D.Sc. (London), F.I.C.	July 1896 .	23rd June 1928
39	Organic Chemist	Vacant . . . .	..	..
40	Assistant, Upper Grade . .	Vacant . . . .	..	..
41	Assistant, Upper Grade . .	Mr. T. P. Ghose, B.Sc., F.C.S.	Oct. 1889 .	1st April 1925
42	Assistant, Upper Grade . .	Vacant . . . .	..	..
			III.—EDUCATIONAL	
43	Lecturer	*Mr. C. E. Simmons, B.A. .	29th Jan. 1889	9th Jan. 1922
44	Do. . . .	*Mr. C. T. Trigg, M.A. .	15th March 1894	15th March 1926
45	Instructor	Mr. R. B. Cornwell . .	20th Feb. 1890	17th Sep. 1924
46	Do. . . .	*Mr. H. P. W. Davis, B.A., B.Sc.	7th Dec. 1893	28th June 1926
47	Assistant Instructor . .	Mr. Shah Nawaz Khan, B.Sc.	16th Aug. 1896	3rd Nov. 1926

*Indicates members of the Imperial Forest Service of

† Overseas pay drawn in sterling in England by members of the Imperial Forest

and College corrected up to 1st April 1929—concl'd.

No.	Head- quarters.	Emoluments.				Remarks.
		Sub- stantive pay.	Over- seas pay.	Allowance.	Total.	
6		7	8	9	10	11
STAFF—concl'd.						
BRANCH—concl'd.						
33	..	..	..	..	..
34	..	..	..	..	..
35	Dehra Dun .	900	†	S. P. 150	1,050	Deputy Conservator of Forests, Bengal.
36	Do. .	430	..	S. P. 75	505	
37	Do. .	250	..	S. P. 75	325	On probation for one year.
BRANCH.						
38	Dehra Dun .	1,000	..	..	1,000	Temporary for 3 years pay Rs. 1,000—50— 1,100 (on probation for one year).
39	..	..	..	..	..
40	..	..	..	..	..
41	Dehra Dun .	350	..	S. P. 75	425	
42	..	..	..	..	..
STAFF.						
43	Dehra Dun .	1,050	†	S. P. 150	1,200	Deputy Conservator of Forests, Assam.
44	Do. .	900	†	S. P. 150	1,050	Do. do. Bengal.
45	Do. .	900	..	S. P. 150	1,050	Do. do. Madras.
46	Do. .	850	†	S. P. 150	1,000	Do. do. Bombay.
47	Do. .	475	..	S. P. 75	550	Extra Assistant Conservator of Forests, United Provinces.

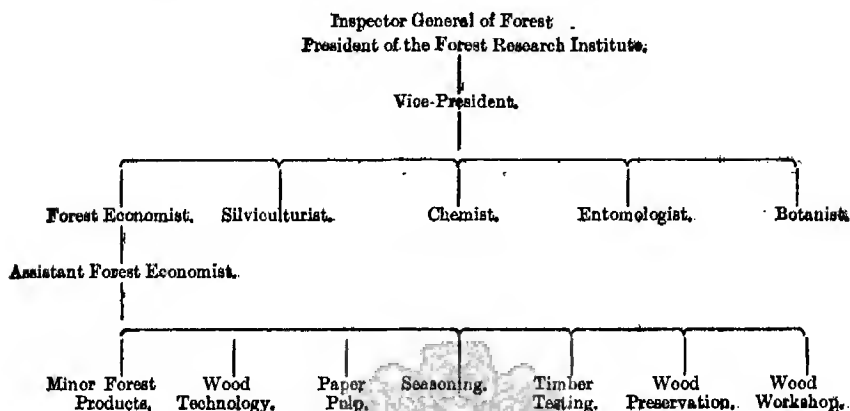
India recruited in England.

Service who are not of Asiatic domicile has not been shown in column 8.

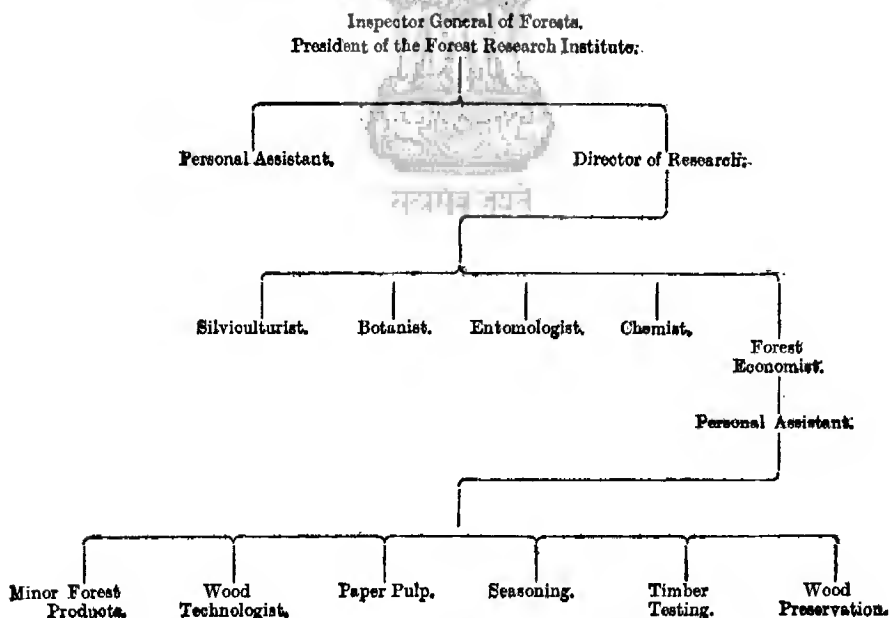
APPENDIX II.

These diagrams are designed to illustrate the changes which it is proposed to make in the organisation of the staff of the Institute.

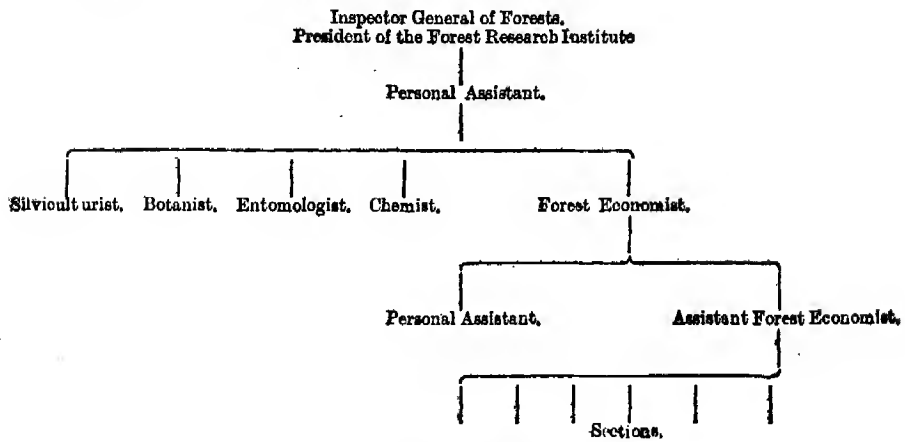
(i) *The present organisation is :—*



(ii) *The proposed organisation is : —*



(iii) The proposed transitional scheme is :—



APPENDIX III.

TENTATIVE SCHEME FOR THE RE-ORGANISATION OF THE CADRE OF THE FOREST RESEARCH INSTITUTE.

1. The scheme aims at giving an officer the opportunity of passing up through 3 grades during 30 years' service.

2. Promotion from one grade to another will be by selection only and not by seniority. This will mean that the good men will advance while the ordinary routine worker will automatically remain at the top of his grade until he is selected for promotion.

3. The scheme is, in principle, the same as the present arrangement in force for the Indian Forest Service, the Provincial Forest and the Ranger Services, *e.g.*, a good Provincial Forest Service officer can be promoted to the Indian Forest Service, while a really brilliant Ranger can be promoted to the Provincial Forest Service and through it to the Indian Forest Service.

4. In the same way, under the proposed scheme, a Grade III man (who will presumably start with good qualifications) will be able to pass through Grade II and after 20 years' service be eligible for selection to Grade I.

5. The pay of grades I, II and III will correspond approximately to the pay of the existing Imperial, Provincial and Ranger Services.

6. The details of any such scheme will have to be worked out carefully after due considerations have been made regarding the existing staff, but so far as can be ascertained there will be no great difficulty in fitting the existing posts into some such scheme.

Grade.	Posts.	Scale of pay.	Remarks.
		Rs.	
Grade I ..	Equivalent to Imperial Service. (Section officers and Assistants)	375—50—1,500	
Grade II ..	Equivalent to Provincial Service. (Upper Grade Assistants, etc.)	250—25—500	
Grade III ..	Equivalent to Ranger Service. (Lower Grade Assistants, Head Computers, etc.) ..	150—10—250	
Grade IV ..	Equivalent to Head Laboratory Assistants, Computers, etc.	100—5—150	
Grade V ..	Equivalent to Laboratory Assistants, Assistant Computers, etc.	60—4—100	
Grade VI ..	Equivalent to Machine operators, Moisture Determinators, etc.	45—3—75	
Grade VII ..	.. ..	30—2—50	
Grade VIII ..	.. ..	20—1—30	